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About E-magazine

“Earth Root” is an open access e-magazine in the discipline of Environmental sciences published by Earth Root Foundation. The aim of the e-magazine is to provide information and upgradation of knowledge about environmental issues on wider scale and to share ideas and resources to the readers. Using essential knowledge people can lead a healthy life, which is more sustainable and can connect with ongoing efforts for stopping catastrophically the climate change. E-magazine caters to all related environmental aspects ranging from big issues like climate change, renewable energy and pollutants in the atmosphere to the health of human and living beings on Earth. We also take topics of water resources and efforts and measurement to provide optimum use of it; including large scale atmospheric circulation linked with oceans and ecology.

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DARKENING THE ARCTIC AND THE RISING THREAT OF BLACK CARBON EMISSIONS

- Dr. Vivek Panwar
Sri Venkateswara College
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In the vast white silence of the Arctic, change is often invisible until it is sudden and irreversible. Ice that once seemed eternal is thinning, retreating, and in some places vanishing altogether. Scientists have long warned that the Arctic is warming nearly four times faster than the global average. While carbon dioxide usually takes centre stage in discussions about climate change, another, less discussed pollutant is quietly accelerating the transformation of the far north: black carbon.

Black carbon is a component of fine particulate matter produced when fossil fuels, biofuels, and biomass burn incompletely. It is commonly known as soot. Unlike carbon dioxide, which can remain in the atmosphere for centuries, black carbon has a relatively short atmospheric lifetime lasting only days to weeks. Yet its impact is disproportionately powerful. It absorbs sunlight efficiently, warming the air directly. When it settles on snow and ice, it darkens the surface, reducing reflectivity and causing faster melting. In a region defined by its whiteness, even a thin layer of soot can dramatically alter

the balance between reflection and absorption of solar energy.

Recent research indicates that black carbon emissions in and around the Arctic are rising, driven largely by expanding shipping routes, increased oil and gas extraction, flaring activities, and forest fires that are becoming more frequent and intense in a warming world. As sea ice retreats, new maritime corridors are opening across the Arctic Ocean, shortening travel times between Asia and Europe. Cargo ships and tankers, many of which run on heavy fuel oil or marine diesel, emit black carbon that can travel long distances before settling on ice sheets and glaciers. The very melting that enables more ships to pass through is intensified by the pollution those ships release.

The Arctic's vulnerability to black carbon is rooted in a simple physical principle. Fresh snow reflects up to 90 percent of incoming sunlight. When soot particles accumulate on the surface, that reflectivity declines. Darker surfaces absorb more heat, which leads to more melting. As ice melts, it exposes darker ocean

water beneath, which absorbs even more solar radiation. This feedback loop known as the ice-albedo effect magnifies warming. Black carbon acts as a catalyst in this process, speeding up changes that might otherwise unfold more gradually.

The sources of Arctic black carbon are both local and distant. Some emissions originate from communities within the Arctic region, where diesel generators and heating systems are still widely used. Oil and gas operations, particularly gas flaring in northern Russia and parts of North America, contribute significantly. At the same time, soot from wildfires in boreal forests and even industrial regions thousands of kilometres away can be transported northward by atmospheric circulation patterns. The Arctic is not isolated from the rest of the world; it is deeply connected to global systems of trade, energy, and climate.

Wildfires deserve special attention. As temperatures rise, forests in Siberia, Alaska, and northern Canada are burning more frequently and more intensely. These fires release massive amounts of black carbon into the atmosphere. Once airborne, the particles can drift over sea ice and Greenland's ice sheet, accelerating melt during the summer months. In some years, satellite observations have detected large plumes of smoke traveling across the Arctic Ocean. Fire seasons that once were limited to a few months are now extending longer, compounding the problem.

The consequences of rising black carbon emissions extend far beyond the Arctic itself. The region plays a crucial role in regulating global climate. Its reflective ice cover helps stabilize temperatures, and its cold waters influence ocean circulation patterns that shape weather worldwide. As Arctic ice diminishes, sea levels rise due to melting glaciers and ice sheets, threatening coastal communities from Mumbai to Miami. Changes in Arctic warming also influence the jet stream, potentially contributing to extreme weather events in mid-latitude regions, including prolonged heatwaves, cold spells, and heavy rainfall.

For Indigenous communities in the Arctic, these changes are immediate and personal. Thinning sea ice makes travel and hunting more dangerous, while altered wildlife migration disrupts traditional livelihoods. Coastal erosion, driven by melting permafrost and stronger wave action, is forcing some villages to consider relocation. Black carbon may be invisible, but its impacts are tangible in daily life.

One striking feature of black carbon is that reducing it offers relatively quick climate benefits. Because it remains in the atmosphere for a short time compared to carbon dioxide, cutting emissions can lead to noticeable cooling within years. This makes it a powerful target for near-term climate action. Technologies to reduce emissions from ships, such as cleaner fuels, filters, and improved engines, already exist. Limiting gas flaring and transitioning Arctic communities to cleaner energy can also make a difference.

International cooperation is essential. The Arctic is bordered by eight nations, but its stability depends on global decisions. Agreements under bodies like the Arctic Council recognize the need to reduce black carbon, yet implementation remains uneven as economic and strategic interests expand. Balancing development with protection is increasingly urgent.

There is also a moral dimension. The Arctic has contributed little to global emissions yet faces some of the earliest consequences. Addressing black carbon is about equity, responsibility, and foresight.

The story of rising Arctic black carbon emissions shows that climate change is shaped by everyday choices. As the Arctic warms, the window for action narrows, and reducing these emissions offers one of the clearest opportunities for rapid climate gains.



HEAT AND FIRE ACROSS THE SOUTHERN HEMISPHERE

- Dr. Palak Balyan
Research Lead, Climate Trends

The year 2026 began with a troubling signal from the Southern Hemisphere as record breaking heatwaves and destructive wildfires spread across several regions. Countries such as Argentina, Chile, Australia, and South Africa faced unusually high temperatures and widespread fires that burned forests, grasslands, and rural settlements. Scientists and environmental agencies warned that these events were not isolated disasters but part of a growing pattern of climate extremes linked to global warming. The intense heat and prolonged dry conditions created an environment where even small sparks could quickly grow into large uncontrollable fires.

In South America, the southern regions of Argentina and Chile experienced one of the most severe wildfire seasons in recent memory. Patagonia, known for its beautiful forests and national parks, saw flames sweeping across large areas of woodland and grassland. Several communities were evacuated as firefighters struggled to contain the blazes. Authorities reported that unusually high temperatures

combined with very low humidity created perfect conditions for fires to spread rapidly. The region had also experienced months of below normal rainfall, which left vegetation dry and highly flammable. Scientists studying the fires pointed out that the probability of such extreme wildfire events has increased significantly due to rising global temperatures.

Local communities in Patagonia faced major disruptions to their livelihoods. Tourism, which supports many small towns in the region, was badly affected as national parks and hiking trails were closed for safety reasons. Smoke from the fires spread across wide areas and reduced air quality in nearby cities. Residents reported breathing difficulties and irritation in the eyes and throat as thick clouds of smoke covered towns and villages. Wildlife habitats were also severely affected as fires destroyed nesting areas and food sources for many species. Environmental groups warned that the ecological damage could take decades to recover because Patagonia hosts unique ecosystems that are sensitive to disturbances.

Australia also experienced extreme heat conditions during the early months of 2026. Several states recorded temperatures that were well above seasonal averages. In some inland regions the temperature crossed forty five degrees Celsius, placing immense stress on both people and ecosystems. The heat triggered multiple bushfires in forested and rural areas. Fire authorities issued warnings across different states and deployed large firefighting teams supported by aircraft to control the spread of flames. Although Australia has long been familiar with bushfires, experts noted that the increasing frequency and intensity of heatwaves are making fire seasons longer and more dangerous.

The impact of heatwaves extended beyond the fires themselves. Urban areas struggled with rising electricity demand as millions of people relied on air conditioning to cope with the extreme temperatures. Energy systems in several cities came under pressure and authorities urged citizens to conserve power. Hospitals also reported an increase in heat related illnesses such as dehydration and heatstroke. Elderly people, outdoor workers, and low income communities were particularly vulnerable to these conditions because they often lack adequate cooling facilities.

Southern Africa also faced difficult environmental conditions during this period. Parts of South Africa experienced prolonged heat combined with dry winds that increased wildfire risk. Grassland fires spread across rural areas and threatened farms and settlements. Firefighters worked continuously to control the blazes while local authorities warned residents to remain cautious and avoid activities that could ignite fires. Agricultural losses were reported as grazing lands burned and livestock faced shortages of fodder. Farmers expressed concern that repeated heatwaves and droughts are making agricultural production increasingly uncertain.

Climate scientists have closely examined the factors behind these extreme events. Many studies indicate that global warming is intensifying heatwaves by raising baseline

Temperatures across the planet are rising, and even a small increase in average global temperature can significantly raise the likelihood of extreme heat events. Warmer air holds more moisture, altering rainfall patterns and contributing to prolonged dry periods in some regions. When vegetation dries after months without rain, it becomes fuel for wildfires, and strong winds with high temperatures allow fires to spread rapidly over large areas.

Researchers warn that wildfire smoke contributes to environmental and health problems. It contains fine particles and gases that can travel long distances, affecting air quality far from the source. In some cases, smoke from fires in Patagonia and Australia spread hundreds of kilometers, impacting cities not directly threatened by flames. Long exposure can cause respiratory diseases and worsen existing conditions, adding pressure on public health systems.

The fires of 2026 highlighted the importance of improved forest management and climate adaptation. Governments are exploring methods to reduce wildfire risks, including controlled burning, satellite monitoring, and community education on fire prevention. Early warning systems have become essential tools, enabling faster detection and response.

Despite these efforts, experts emphasize that long-term solutions must address the root causes of climate change. Reducing greenhouse gas emissions remains critical to limit warming and prevent more extreme heatwaves. International cooperation and stronger climate policies are necessary to protect ecosystems, as such events may become more frequent and severe in the coming decades.

The events of early 2026 show how closely human societies are linked to the natural environment. Heatwaves and wildfires affect ecosystems, economies, health systems, and daily life. These disasters highlight the urgent need for stronger environmental stewardship and global climate action.



RISING WATERS AND FRAGILE SLOPES: THE TRAGEDY OF BRAZIL'S 2026 FLOODS

- Mr. Ankur Goel

Director, Copper Cross Solutions

In February 2026, Brazil witnessed one of the most devastating environmental disasters in recent years when intense rainfall triggered widespread floods and landslides in several parts of the country. The disaster struck particularly hard in the southeastern state of Minas Gerais, where communities in the Zona da Mata region faced overwhelming destruction. Torrential rains fell continuously for several days, swelling rivers, saturating hillsides, and destabilizing the fragile landscape. Homes collapsed, roads disappeared beneath muddy torrents, and thousands of residents were forced to abandon their neighborhoods in search of safety.

The floods and landslides caused tragic loss of life and extensive damage to infrastructure. Many towns were suddenly cut off from nearby cities as bridges were washed away and roads became impassable. Rescue teams struggled to reach remote areas because water and mud had buried important transportation routes. Emergency workers and volunteers worked around the clock to locate survivors trapped under debris or stranded in flooded homes. The scale of the disaster revealed how vulnerable

many Brazilian communities remain to extreme weather events.

Heavy rainfall is not uncommon in Brazil's summer season, but the intensity of precipitation during February 2026 exceeded normal patterns in several locations. Meteorological stations recorded rainfall amounts far above monthly averages within just a few days.

Rivers that usually flow gently through valleys suddenly transformed into powerful currents that swept away vehicles, damaged buildings, and flooded entire neighborhoods. As the water levels rose rapidly, residents had little time to prepare or evacuate.

The geography of the affected region contributed significantly to the severity of the disaster. Much of southeastern Brazil is characterized by steep hills, narrow valleys, and densely populated slopes. Over many decades, expanding urban settlements have spread into areas that are naturally vulnerable to landslides. Houses built along hillsides often rest on unstable soil that becomes dangerously loose when saturated by heavy rainfall. In 2026, continuous downpours weakened these slopes

and caused sudden collapses that buried homes and roads beneath thick layers of mud. Local authorities reported that thousands of people were displaced as floodwaters entered residential areas. Schools, community centers, and sports halls were quickly converted into temporary shelters for families who had lost their homes. Many residents escaped with only a few belongings as rising water forced them to flee during the night. In shelters, displaced families faced uncertainty about when they would be able to return and what remained of their houses.

Beyond the immediate human tragedy, the floods also disrupted economic activity across the region. Small businesses, agricultural fields, and local markets were heavily affected. Floodwaters damaged crops and livestock, threatening the livelihoods of farmers who depend on seasonal harvests. In urban areas, commercial streets remained closed for days as workers cleared mud and debris from shops and public spaces. The economic impact of the disaster extended far beyond the initial destruction, affecting communities that rely on stable infrastructure and transportation networks.

Environmental scientists have increasingly warned that extreme rainfall events are becoming more frequent and intense as the global climate warms. Warmer air holds more moisture, which can lead to heavier precipitation during storms. In regions with complex topography such as southeastern Brazil, intense rainfall can quickly overwhelm drainage systems and destabilize slopes. The events of February 2026 have strengthened concerns that climate change is amplifying the risks faced by vulnerable communities.

Urban planning challenges have also played a role in increasing the impact of such disasters. Rapid population growth in many Brazilian cities has pushed housing development into areas that were previously forested or sparsely populated. In some cases, informal settlements have emerged on steep hillsides without adequate engineering support or drainage systems. When heavy rain arrives, these

locations become particularly dangerous because the soil can lose stability very quickly. The landslides of 2026 revealed how urban expansion without proper planning can increase exposure to natural hazards.

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drinking water, and medical aid to isolated communities. Government agencies also began assessing the structural damage to roads, bridges, and public buildings in order to plan long term recovery measures.

The disaster sparked renewed national discussion about disaster preparedness and climate resilience. Experts emphasized the need for improved early warning systems that can alert residents before landslides occur. Monitoring rainfall intensity and soil saturation can help authorities identify high risk areas and initiate evacuations before slopes collapse. Strengthening drainage infrastructure and restricting construction in vulnerable zones are also considered important steps in reducing future risks.

Communities affected by the floods showed remarkable resilience during recovery. Volunteers organized donation drives to provide clothing, food, and essential supplies for displaced families, while local organizations worked with government agencies to support reconstruction and restore public services. In many towns, neighbors came together to clear debris and repair homes, highlighting strong social bonds in times of crisis.

The floods and landslides of February 2026 highlight how environmental hazards can quickly become humanitarian disasters. While extreme rainfall may be natural, its impacts are shaped by human decisions on land use, infrastructure, and climate policy. As Brazil faces climate change and urban growth, lessons from this tragedy can help build safer and more resilient communities.

ENGAGING PARASITE ECOLOGY TRIVIA QUIZ: TEST YOUR KNOWLEDGE!

- Dikshita Goswami and Shatakshi Dubey
Department of Zoology
Ramjas College, University of Delhi,

INTRODUCTION

ARE YOU READY TO EXPLORE THE HIDDEN WORLD OF PARASITIC LIFE AND THEIR HOST? THE HOST AND PARASITE ARE IN A DYNAMIC, COMPLEX INTERRELATIONSHIP, THE OUTCOME OF WHICH CAN BE MAINLY PARASITIC, SYMBIOTIC, OR COMMENSAL. THIS TRIVIA QUIZ IS SHAPED TO TEST YOUR MASTERY OF PARASITE BIOLOGY AND ITS ENVIRONMENT. THESE SITUATION-BASED QUESTIONS WILL BE PRIMARILY FROM THE STUDY OF PARASITES, BASICS OF HOST-PARASITE INTERACTIONS AND PARASITIC DISEASES, INCLUDING DIAGNOSIS AND TREATMENT OF COMMON PARASITIC INFECTIONS. ALONG THE WAY, THIS FREE CONTEST WILL SHARPEN YOUR CURIOUS MIND, EXPERTISE AND EXPAND YOUR KNOWLEDGE TO UNDERSTAND THE DIVERSITIES OF PARASITES IN THE LIGHT OF CO-EVOLUTIONARY DYNAMICS AND ECOLOGICAL IMPACTS. DON'T WAIT - START NOW AND PROVE YOU HAVE GOT WHAT IT TAKES!

QUESTION 1:

I'M A GIANT, BUT NOT A BEAST,
I LIVE INSIDE, WHERE MEALS ARE FEAST.
IN PIGS AND HUMANS, I RESIDE,
IN ASIA'S LANDS, I LIKE TO HIDE.
RAW PLANTS ARE HOW I MAKE MY WAY, GUESS MY NAME
WITHOUT DELAY.
I AM ALSO KNOWN AS GIANT INTESTINAL FLUKES. WHO
AM I?

QUESTION 2:

I HIDE IN THE WATER, TOO SMALL TO BE SEEN,
THROUGH A SNAIL, I GROW AND TURN INTO SOMETHING
MEAN.
I SNEAK THROUGH THE SKIN OF THOSE WHO SWIM,
CAUSING DISEASE THAT MAKES HEALTH DIM.
I TRAVEL IN BLOOD, IN VEINS I ROAM, IN BLADDER OR
GUT, I MAKE MY HOME.
I AM ALSO KNOWN AS URINARY BLOOD FLUKES. WHAT
AM I?

QUESTION 3:

I START AS AN EGG, TOO SMALL FOR THE EYE
IF YOU SWALLOW ME, I MAKE YOU CRY.
TO YOUR BRAIN I MAKE MY COURSE, CAUSING SEIZURES
WITH MIGHTY FORCE.
I AM THE LARVAE OF THE TAPEWORM TAENIA SOLIUM,
ALSO KNOWN AS THE 'PORK TAPEWORM'.
WHICH PARASITIC INFECTION OF THE NERVOUS SYSTEM
IS CAUSED BY US?

QUESTION 4:

I START IN THE LIVER, THEN INVADE THE BLOOD CELLS
CAUSING FEVER AND CHILLS TO THE HUMAN HOST.
I AM SINGLE-CELLED PARASITES BELONGING TO THE
PLASMODIUM GENUS.
I AM THE MOST WIDESPREAD OF ALL OF THE MALARIA
SPECIES. WHO I AM?

QUESTION 5:

IN THE TSETSE FLY,
I TRANSFORM SEVERAL TIMES BEFORE BECOMING
INFECTIOUS AGAIN.
WHERE DO I MULTIPLY BEFORE REACHING THE SALIVARY
GLAND?

QUESTION 6:

I'M THE FORM OF THE MALARIA PARASITE THAT THE
MOSQUITO INJECTS INTO HUMANS.
WITHOUT ME THE CYCLE CANNOT START.
WHAT AM I?

QUESTION 7:

A MOSQUITO AND A TSETSE FLY ARE ARGUING.
THE MOSQUITO BRAGS, "I'M THE DEADLIEST INSECT IN
THE WORLD! I SPREAD MALARIA!"
THE TSETSE FLY SMIRKS AND SAYS "WELL I DON'T JUST
MAKE PEOPLE SICK BUT I MAKE THEM SLEEP!" WHAT
DISEASE IS THE TSETSE FLY TALKING ABOUT?

QUESTION 8:

A PATIENT TRAVELS TO A TROPICAL COUNTRY AND
STARTS EXPERIENCING BLOODY DIARRHEA AND
STOMACH PAIN.
A STOOL SAMPLE REVEALS MOTILE FORM OF A
PARASITE.
WHICH STAGE OF E. HISTOLYTICA WAS FOUND IN THE
STOOL?

QUESTION 9:

THE DORMANT STAGE OF PLASMODIUM VIVAX IN THE
LIVER IS KNOWN AS?

QUESTION 10:

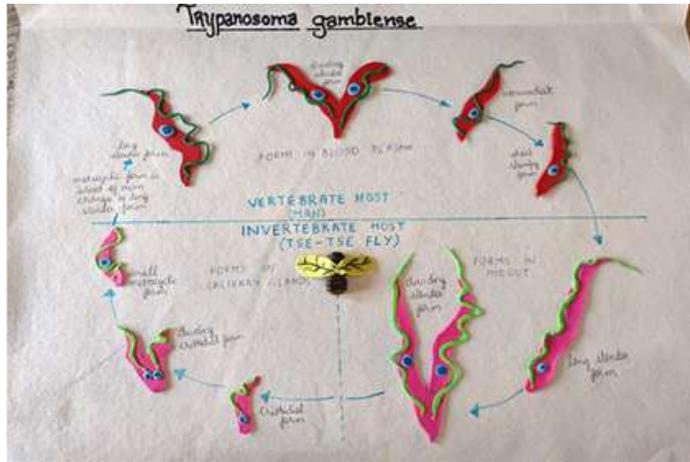
WHICH PART OF THE PIG DOES TAENIA SOLIUM
CYSTICERCI (OR LARVAL CYSTS) DEVELOP IN?

EXPERIENTIAL LEARNING EXERCISE FOR YOUNG READERS

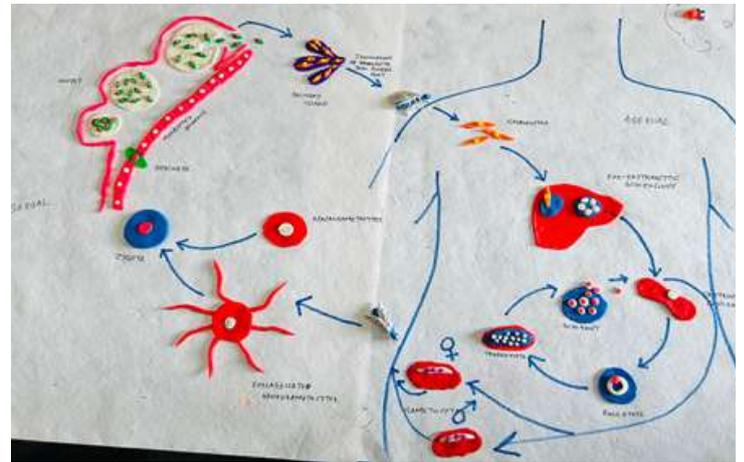
TASK: CREATE A PARASITE LIFE CYCLE USING CLAY MODELING TO VISUALIZE AND UNDERSTAND THE MULTI-STAGE LIFE CYCLE OF A PARASITE.

LEARNING OBJECTIVES: UNDERSTAND HOW PARASITES MOVE AMONG ENVIRONMENTS AND HOSTS, AND THE MORPHOLOGICAL CHANGES THEY UNDERGO DURING THEIR COMPLEX LIFE CYCLE. THE PICTURES BELOW SHOW A FEW EXAMPLES FROM OUR PRACTICAL CLASSES.

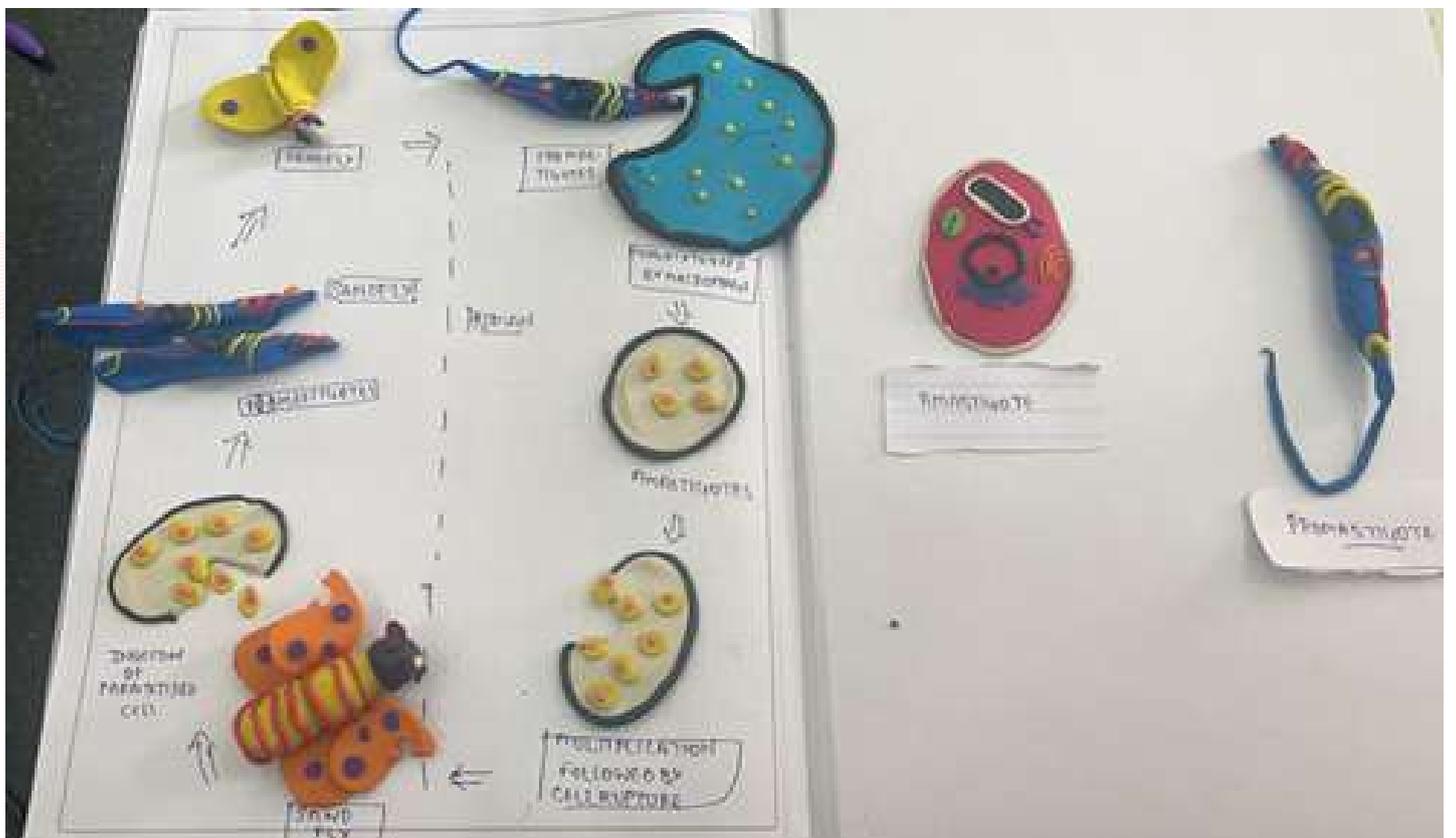
(A) TRYPANOSOMA BRUCEI GAMBIENSE



(B) PLASMODIUM VIVAX



(C) LEISHMANIA



CORRECT ANSWERS OF QUIZ QUESTIONS:

- ANSWER 1: FASCIOLOPSIS BUSKI
- ANSWER 2: SCHISTOSOMA HAEMATOBIIUM
- ANSWER 3: NEUROCYSTICERCOSIS (NCC)
- ANSWER 4: PLASMODIUM VIVAX
- ANSWER 5: MIDGUT
- ANSWER 6: SPOROZOITE
- ANSWER 7: AFRICAN SLEEPING SICKNESS
- ANSWER 8: TROPHOZOITE
- ANSWER 9: HYPNOZOITES
- ANSWER 10: MUSCLES (SKELETAL MUSCLES) OF THE PIG

MOVIE

RECOMMENDATION

THE END

The End (2024), directed by Joshua Oppenheimer, is a post-apocalyptic musical drama set in a future where environmental collapse has rendered the Earth's surface uninhabitable. The story follows a wealthy family living in a luxurious underground bunker, sustained by technology and strict routines. Their seemingly stable existence is disrupted when a young outsider arrives, challenging their carefully constructed reality. Through music, memory, and emotional tension, the film explores themes of guilt, privilege, denial, and the long-term consequences of human actions on the planet.

PLOT SYNOPSIS

Set decades after a global environmental collapse, the film follows a wealthy family living in a self-sustaining underground bunker. The group includes a mother, father, and son, along with a few carefully selected companions. They survive in isolation, surrounded by art, music, and rituals that recreate a sense of normal life, with strict routines and an unspoken agreement to avoid confronting the past that led to the world's destruction.

The father, a powerful industrialist before the collapse, carries a hidden burden of guilt tied to the catastrophe, yet maintains authority by reinforcing a narrative that justifies their survival and privilege. The mother clings to cultural refinement music, performance, and etiquette to preserve meaning in an artificial world, while their son, raised entirely underground, begins to question the reality he has been taught.

The fragile balance is disrupted when a young outsider arrives from the surface. Her presence challenges the group's carefully maintained illusions, and unlike the others, she has experienced the harsh realities of the outside world. Through her interactions, especially with the son, long-suppressed tensions begin to surface.

As the story unfolds, secrets about the past emerge, including the father's role in environmental destruction and the moral compromises that enabled survival. The bunker shifts from a symbol of safety to a psychological prison where denial and guilt collide, with musical sequences reflecting inner conflicts beneath polished performances.

In the end, the film moves toward a confrontation between truth and illusion. The younger generation, influenced by the outsider, begins to reject inherited narratives of denial. The story closes on an ambiguous yet powerful note, suggesting that while survival is possible, true reckoning with the past and the possibility of change remains uncertain.





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Satellite imagery shows that, unlike the usual cyclonic curve, this system appears as a long, straight low-pressure band, forcing air to rise quickly and leading to heavy clouds, rain and turbulence. Moreover, the system is peaking during the summer rather than mid-winter.

Source:- <https://www.facebook.com/photo/?fbid=1357377176411720&set=pcb.1357377299745041>

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