UP Board Class 12 Biology 2026 (Set 348 EH) Question Paper with Solutions

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General Instructions

(i) This booklet contains 9 questions, each provided with a complete, step-by-step solution.

(ii) It comprises 4 single-correct multiple-choice questions.

(iii) Attempt each question on your own before reviewing the given solution.

1(a). Pollen grains are formed in which organ of the flower?

(A) Microsporangium

(B) Gynoecium

(C) Megasporangium

(D) Ovary

Correct Answer: (A) Microsporangium

Solution:

Step 1: Understanding the Concept:
Pollen grains are the male gametophytes of a flowering plant, produced inside the anther of the stamen.

Step 2: Locating the Site of Formation:
Each anther is typically bilobed, and each lobe has two elongated sac-like structures called microsporangia (pollen sacs). Microspore mother cells inside the microsporangia undergo meiosis to form microspore tetrads, which mature into pollen grains.

Step 3: Why the other options are wrong:
Gynoecium (B) is the female reproductive whorl, not where pollen forms. Megasporangium (C) is the ovule, which produces the megaspore (female gametophyte), not pollen. Ovary (D) houses the ovules, again on the female side.

Final Answer:
Microsporangium

1(b). The process of fertilization occurs in which part of the female reproductive system?

(A) In ampulla area

(B) In sertoli cells

(C) In isthmus

(D) In fallopian tube

Correct Answer: (A) In ampulla area

Solution:

Step 1: Understanding the Concept:
Fertilisation is the fusion of the male gamete (sperm) with the female gamete (secondary oocyte) to form a zygote.

In humans it occurs internally, inside the female reproductive tract.

Step 2: Locating the Exact Site:
The oviduct (fallopian tube) is divided into infundibulum, ampulla and isthmus. NCERT specifies that fertilisation occurs at the ampullary-isthmic junction, i.e. in the ampulla region of the fallopian tube.

Step 3: Why the other options are wrong:
Sertoli cells (B) belong to the male testis and provide nourishment to developing sperm, not a fertilisation site. Isthmus alone (C) is only part of the actual junction. 'Fallopian tube' (D) is too general compared to the specific ampulla region asked for.

Final Answer:
Fertilisation occurs in the ampulla region of the fallopian tube

1(c). How many contrasting characters were included by Mendel in his experiment?

(A) 7
(B) 8
(C) 10
(D) 12

Correct Answer: (A) 7

Solution:

Step 1: Understanding the Concept:
Gregor Mendel conducted hybridisation experiments on garden pea (Pisum sativum) to study the pattern of inheritance.

Step 2: Recalling the Traits Studied:
He selected exactly seven pairs of contrasting characters — seed shape, seed colour, pod shape, pod colour, flower colour, flower position, and plant/stem height.

Final Answer:
7

1(d). Which nitrogenous base is not present in DNA?

(A) Thymine
(B) Uracil
(C) Adenine
(D) Guanine

Correct Answer: (B) Uracil

Solution:

Step 1: Understanding the Concept:
DNA and RNA both contain purine bases (Adenine, Guanine) and pyrimidine bases, but they differ in one pyrimidine base.

Step 2: Comparing DNA and RNA Bases:
DNA contains Adenine, Guanine, Cytosine and Thymine. RNA contains Adenine, Guanine, Cytosine and Uracil in place of Thymine.

Step 3: Identifying the Answer:
Since Uracil replaces Thymine only in RNA, Uracil is the base that is absent from DNA.

Final Answer:
Uracil

2(a). Two nitrogenous bases are linked by which bond?

Correct Answer: —

Solution:

Step 1: Understanding the Concept:
In the double-helix model of DNA, the two polynucleotide strands are held together by pairing between complementary nitrogenous bases on opposite strands.

Step 2: Naming the Bond:
This complementary base pairing (Adenine with Thymine via 2 bonds, Guanine with Cytosine via 3 bonds) is due to hydrogen bonding.

Final Answer:
Hydrogen bonds

2(b). Write one example of bio-fertilizer.

Correct Answer: —

Solution:

Step 1: Understanding the Concept:
Bio-fertilizers are living organisms (bacteria, fungi, cyanobacteria) that enrich soil fertility by adding nutrients naturally, mainly by fixing atmospheric nitrogen.

Step 2: Giving an Example:
Rhizobium is a nitrogen-fixing bacterium that lives symbiotically in the root nodules of leguminous plants and converts atmospheric nitrogen into a usable form for the plant.

Final Answer:
Rhizobium

2(c). Write the complete form of the abbreviation PCR.

Correct Answer: —

Solution:

Step 1: Understanding the Concept:
PCR is a widely used molecular biology technique to amplify a single copy or a few copies of a DNA segment into thousands to millions of copies.

Final Answer:
PCR = Polymerase Chain Reaction

2(d). Write the name of any one project being run to save rivers from pollution.

Correct Answer: —

Solution:

Step 1: Understanding the Concept:
The Government of India has launched river conservation projects to control the pollution load reaching major rivers from sewage and industrial effluents.

Step 2: Naming the Project:
The Ganga Action Plan (GAP), launched in 1985, is a well-known project aimed at reducing pollution in the river Ganga.

Final Answer:
Ganga Action Plan

2(e). What is a green plant called in the terminology of an ecosystem?

Correct Answer: —

Solution:

Step 1: Understanding the Concept:
In an ecosystem, organisms are classified based on their nutritional role. Green plants can manufacture their own food using sunlight, water and CO_2 through photosynthesis.

Step 2: Naming the Role:
Because they produce food (organic matter) from inorganic raw materials, green plants are called producers or autotrophs.

Final Answer:
Producer (autotroph)

3(a). Define detritivore with an example.

Correct Answer: —

Solution:

Step 1: Definition:
Detritivores (or decomposer-feeders) are organisms that feed directly on detritus — the dead and decaying organic remains of plants and animals — and break it into smaller particles, a process called fragmentation, which speeds up microbial decomposition.

Step 2: Example:
Earthworms are common detritivores; other examples include millipedes, dung beetles and some soil mites.

Final Answer:
Earthworm is a detritivore that feeds on detritus and fragments it

3(b). Write a brief description of a bioreactor.

Correct Answer: —

Solution:

Step 1: Definition:
A bioreactor is a large vessel in which raw materials are biologically converted, using living cells (microbial, plant, animal, or human) or their enzymes, into a specific product under controlled optimum conditions.

Step 2: Key Operating Conditions:
Inside a bioreactor, factors such as temperature, pH, substrate concentration, salts, vitamins and oxygen are maintained at optimum levels to maximise product yield.

Step 3: Common Type:
The most widely used type is the stirred-tank bioreactor, which has an agitator to mix the contents thoroughly and an oxygen-delivery system to ensure adequate aeration throughout the vessel.

Final Answer:
A bioreactor is a vessel used for large-scale, controlled production of biotechnological products using living cells or enzymes

3(c). Define somatic hybridisation.

Correct Answer: —

Solution:

Step 1: Definition:
Somatic hybridisation is a technique of plant biotechnology in which the protoplasts (cells whose cell wall has been enzymatically removed) of two different plant varieties or species are fused together artificially, using chemical or electrical methods, to produce a hybrid protoplast.

Step 2: Outcome:
This hybrid protoplast is cultured to regenerate a complete hybrid plant that combines desirable characters from both parent plants — this bypasses the natural barriers of sexual incompatibility.

Step 3: Example:
'Pomato', a hybrid obtained by fusing protoplasts of potato and tomato, is a classic example of somatic hybridisation.

Final Answer:
Somatic hybridisation is the artificial fusion of two somatic protoplasts to form a hybrid plant

3(d). Name any two fungal species which are used in the production of antibiotics.

Correct Answer: —

Solution:

Step 1: Understanding the Concept:
Antibiotics are chemical substances produced by certain microbes that can kill or inhibit the growth of other disease-causing microbes; several are obtained from fungi.

Step 2: Naming the Species:
Penicillium notatum (and P. chrysogenum) is the fungus that produces Penicillin, the first antibiotic discovered by Alexander Fleming. Cephalosporium species is another fungus used to produce the antibiotic Cephalosporin.

Final Answer:
Penicillium and Cephalosporium

3(e). Define cancer.

Correct Answer: —

Solution:

Step 1: Definition:
Cancer is a disease in which some of the body's cells lose the normal control over cell division and grow in an uncontrolled, abnormal manner, invading and damaging the surrounding normal tissue.

Step 2: Key Feature: Metastasis:

Unlike a benign tumour, malignant (cancerous) cells can undergo metastasis — they break away, enter blood or lymph vessels, and travel to distant parts of the body to form new (secondary) tumours.

Step 3: Underlying Cause:
This uncontrolled proliferation results from mutations affecting proto-oncogenes (which become oncogenes) and tumour suppressor genes, which normally regulate the cell cycle.

Final Answer:
Cancer is uncontrolled, invasive cell proliferation capable of metastasis to other body parts

4(a). What do you understand by intra-uterine insemination?

Correct Answer: —

Solution:

Step 1: Understanding the Concept:
Intra-uterine insemination (IUI), also called Artificial Insemination (AI), is an Assisted Reproductive Technology (ART) used to treat certain cases of infertility, particularly when the male partner has a low sperm count.

Step 2: Describing the Procedure:
Semen is collected, either from the husband or from a healthy donor, and is artificially introduced by a doctor into the vagina or directly into the uterus of the female at the appropriate time in her cycle.

Step 3: Purpose:
This technique bypasses barriers to natural fertilisation (such as low sperm motility or count) and increases the chance of the sperm reaching and fertilising the egg.

Final Answer:
IUI is the artificial introduction of semen into the female genital tract/uterus to achieve pregnancy

4(b). Describe the functions of a promoter.

Correct Answer: —

Solution:

Step 1: Understanding the Concept:
A promoter is a specific DNA sequence located upstream (towards the 5' end) of the structural gene(s) in a transcription unit/operon.

Step 2: Function 1 — Binding Site:
It provides the site to which RNA polymerase binds so that transcription can begin.

Step 3: Function 2 — Directionality:
It determines which of the two DNA strands is to be used as the template and the direction in which transcription

proceeds.

Step 4: Function 3 — Regulation:
Along with regulatory sequences (e.g. operator, in the lac operon), the promoter helps control the rate/efficiency of transcription initiation.

Final Answer:
The promoter provides the RNA polymerase binding site and sets the start point and direction of transcription

4(c). What is DNA fingerprinting? What is its importance in human life?

Correct Answer: —

Solution:

Step 1: Definition:
DNA fingerprinting is a technique that detects variation (polymorphism) in the DNA sequence of every individual, based on highly repetitive, non-coding DNA sequences called VNTRs (Variable Number of Tandem Repeats, a type of satellite DNA). It was developed by Alec Jeffreys.

Step 2: Why It Works:
Because the number of repeats of these VNTR sequences varies from person to person (except identical twins), the resulting banding pattern on a gel acts like a unique 'fingerprint' for each individual.

Step 3: Importance in Human Life:
It is used in forensic science to identify criminals or victims from biological evidence (blood, hair, semen) at a crime scene, in paternity/maternity testing to establish biological parentage, and in evolutionary and population genetic studies.

Final Answer:
DNA fingerprinting compares VNTR-based DNA patterns to identify individuals uniquely, aiding forensics and paternity testing

4(d). What is colostrum? Highlight its usefulness.

Correct Answer: —

Solution:

Step 1: Definition:
Colostrum is the yellowish fluid secreted by a mother's mammary glands during the first few days after childbirth, before regular breast milk production is established.

Step 2: Usefulness 1 — Immunity:
It is rich in antibodies, particularly Immunoglobulin A (IgA), which provide passive immunity to the newborn, protecting it against several infectious diseases in its early, vulnerable days.

Step 3: Usefulness 2 — Nutrition:
It is also highly nutritious, supplying the newborn with essential proteins and nutrients required for early growth and development.

Final Answer:
Colostrum is antibody-rich first milk that protects and nourishes the newborn

5(a). Draw the diagram of the male reproductive system.

Correct Answer: —

Solution:

Step 1: Key Structures to Label:
A correctly labelled diagram of the human male reproductive system should show, from the scrotum outward along the passage of sperm: the paired testes inside the scrotal sac, epididymis, vas deferens, seminal vesicle, ejaculatory duct, prostate gland, bulbourethral (Cowper's) gland, urethra, and the penis.

Step 2: Functional Note per Structure:
Testes produce sperm and testosterone; the epididymis stores and matures sperm; the vas deferens transports sperm to the urethra; the seminal vesicles, prostate and bulbourethral glands add secretions that, together with sperm, form semen; the urethra and penis form the common passage for semen and urine to exit the body.

Final Answer:
Label testes, epididymis, vas deferens, seminal vesicle, prostate, bulbourethral gland, urethra and penis

5(b). Explain hibernation with an example.

Correct Answer: —

Solution:

Step 1: Definition:
Hibernation is a state of dormancy or greatly reduced metabolic activity that certain animals, especially mammals living in cold climates, undergo to survive the harsh winter season.

Step 2: Physiological Basis:
During hibernation the animal's body temperature, heart rate, and metabolic rate drop significantly, which conserves energy at a time when food is scarce and environmental temperatures are extremely low.

Step 3: Example:
Bears are the most familiar example of hibernating mammals; bats and certain ground squirrels also hibernate through winter.

Final Answer:
Hibernation is winter dormancy with lowered metabolism to survive cold and food scarcity, e.g. in bears

5(c). Which test confirms typhoid fever? Describe its symptoms.

Correct Answer: —

Solution:

Step 1: Identifying the Test:
Typhoid fever, caused by the bacterium Salmonella typhi, is confirmed using the Widal test, which detects specific antibodies produced against the bacterium in the patient's blood serum.

Step 2: Describing the Symptoms:
The disease presents with sustained high fever (around 39-40 degrees Celsius), body weakness, abdominal (stomach) pain, headache, and loss of appetite.

Step 3: Complication:
In untreated or severe cases, the bacteria can cause intestinal perforation, which is a serious, potentially fatal complication.

Final Answer:
Widal test confirms typhoid; symptoms include sustained high fever, weakness, stomach pain and headache

5(d). Draw a labelled diagram of a dehisced anther.

Correct Answer: —

Solution:

Step 1: Structure of the Anther:
A typical anther is bilobed, and each lobe contains two microsporangia (pollen sacs), giving four microsporangia (pollen sacs) in total, arranged in a dithecous anther.

Step 2: What 'Dehisced' Means:
'Dehisced' means the anther has split open (usually along a line called the stomium/line of dehiscence) at maturity to release the mature pollen grains.

Step 3: Labels to Include:
The diagram should label: the epidermis (outer covering), endothecium (fibrous layer aiding dehiscence), the (often degenerated) septum between sporangia of a lobe, the connective joining the two lobes, the line of dehiscence, and the pollen grains being released from the opened sporangia.

Final Answer:
A dehisced anther shows its two lobes split open along the line of dehiscence, releasing pollen grains

6(a). Give a brief description of the decomposition cycle with a diagram.

Correct Answer: —

Solution:

Step 1: Definition:
Decomposition is the process by which decomposers (mainly bacteria and fungi) break down complex organic matter of dead plants and animals (detritus) into simpler inorganic substances.

Step 2: Step 1 — Fragmentation:
Detritivores (e.g. earthworms) break detritus into smaller particles, increasing the surface area available for microbial attack.

Step 3: Step 2 — Leaching:
Water-soluble inorganic nutrients percolate down through the soil and get precipitated as unavailable salts.

Step 4: Step 3 — Catabolism:
Bacterial and fungal enzymes degrade the detritus into simpler inorganic substances by extracellular enzymatic breakdown.

Step 5: Step 4 — Humification and Mineralisation:
Humification leads to the accumulation of a dark, amorphous substance called humus, which is highly resistant and decomposes very slowly; mineralisation of humus by microbes further releases inorganic nutrients, completing the cycle so producers can reuse them.

Final Answer:
Decomposition proceeds through fragmentation, leaching, catabolism, humification and mineralisation

6(b). Write a short note on chromosomal disorders.

Correct Answer: —

Solution:

Step 1: Understanding the Concept:
Chromosomal disorders result from an abnormal number of chromosomes (aneuploidy) or structural changes in chromosomes, and often produce characteristic sets of symptoms in affected individuals.

Step 2: Down's Syndrome:
Caused by trisomy of chromosome 21 (three copies instead of two). Features include short stature, a small round head, a partially open mouth with a protruding, furrowed tongue, and varying degrees of mental retardation.

Step 3: Klinefelter's Syndrome:
Caused by an extra X chromosome, karyotype 47, XXY. Affected individuals are male but show feminine body development (e.g. gynaecomastia) and are typically sterile.

Step 4: Turner's Syndrome:
Caused by the absence of one X chromosome in females, karyotype 45, Xo. Features include short stature, a

webbed neck, and sterility due to rudimentary, non-functional ovaries.

Final Answer:
Chromosomal disorders (e.g. Down's, Klinefelter's, Turner's syndromes) arise from abnormal chromosome number or structure

6(c). Describe the properties of genetic material.

Correct Answer: —

Solution:

Step 1: Property 1 — Replication:
The genetic material must be able to replicate itself accurately, so that it can be faithfully passed on from parent cell to daughter cell (or parent to offspring).

Step 2: Property 2 — Chemical and Structural Stability:
It should be chemically and structurally stable, so the information it carries is not easily altered during normal cell processes across generations.

Step 3: Property 3 — Scope for Slow Mutation:
It should allow for slow but stable changes (mutations), which are essential to provide the genetic variation required for evolution.

Step 4: Property 4 — Expression:
It should be able to express itself as Mendelian (observable) characters in the form of the 'phenotype', through the processes of transcription and translation.

Final Answer:
Genetic material must be able to replicate, be stable, allow mutation, and express itself as the phenotype

6(d). Write a note on the chromosomal theory of inheritance.

Correct Answer: —

Solution:

Step 1: Who Proposed It:
The chromosomal theory of inheritance was proposed independently by Walter Sutton and Theodor Boveri in 1902.

Step 2: The Core Idea:
The theory states that chromosomes are the carriers of genetic material (genes), and that during meiosis, chromosomes segregate and assort independently in the very same manner as Mendelian factors (genes) do.

Step 3: Experimental Verification:
This theory was experimentally verified by Thomas Hunt Morgan and his colleagues through breeding experiments

on the fruit fly Drosophila melanogaster, which established that genes are physically located on chromosomes.

Final Answer:
Chromosomes carry genes and segregate during meiosis exactly as Mendel's factors do; verified by Morgan using Drosophila

7. Why are transgenic animals produced? Highlight the reasons.

Correct Answer: —

Solution:

Step 1: Understanding the Concept:
Transgenic animals are animals that have had their DNA manipulated to possess and express an additional (foreign) gene, and they are produced for several important reasons.

Step 2: Reason 1 — Studying Normal Physiology and Development:
Transgenic animals allow scientists to study how genes are regulated and how they affect the normal functions of the body and its development.

Step 3: Reason 2 — Study of Disease:
Many transgenic animals are specially designed to serve as models for human diseases, such as cancer, cystic fibrosis, and rheumatoid arthritis, allowing researchers to study disease progression and test potential new treatments.

Step 4: Reason 3 — Production of Biological Products:
Transgenic sheep and cows have been engineered to produce useful biological products (such as the human protein alpha-1-antitrypsin, used to treat emphysema) in their milk.

Step 5: Reason 4 — Vaccine and Chemical Safety Testing:
Transgenic mice are being developed to test the safety of vaccines (e.g. polio vaccine) before they are used on human beings, and transgenic animals can also be used to detect the toxicity of new chemical substances more quickly than testing on normal animals.

Final Answer:
Transgenic animals are produced to study gene function, model human diseases, manufacture biological products, and test vaccin

OR

Write explanatory notes on the following: (i) Transgenic plants (ii) Transfer of recombinant DNA into host cells.

Correct Answer: —

Solution:

Step 1: (i) Transgenic Plants — Definition:
Plants that carry and express a foreign gene, introduced into them using genetic engineering techniques, are called transgenic plants.

Step 2: (i) Transgenic Plants — Purpose and Example:
This foreign gene confers a desired trait, such as pest resistance in Bt cotton (which carries a cry gene from the bacterium Bacillus thuringiensis), herbicide tolerance, or improved nutrition, such as Golden Rice, which is enriched with beta-carotene.

Step 3: (ii) Transfer of Recombinant DNA — Making Cells Competent:
After a desired gene is inserted into a suitable vector to form recombinant DNA, it must be introduced into a host cell. Bacterial cells are made 'competent' to take up DNA by treating them with a specific concentration of a divalent cation, such as calcium chloride, which increases the efficiency of DNA entry through the pores in the cell wall.

Step 4: (ii) Transfer of Recombinant DNA — Introducing the DNA:
The recombinant DNA is then incubated with the competent cells on ice, followed by a brief heat shock at 42 degrees Celsius and then putting them back on ice, causing the bacterial cells to take up the recombinant DNA (transformation).

Step 5: (ii) Transfer of Recombinant DNA — Direct Methods:
Alternative direct methods are also used, especially for plant and animal cells: microinjection, in which recombinant DNA is directly injected into the nucleus of an animal cell; the gene gun/biolistic method, where high-velocity DNA-coated microparticles are bombarded into plant cells; and the use of a disarmed pathogen vector such as Agrobacterium tumefaciens, which naturally transfers DNA into host plant cells.

Final Answer:
Transgenic plants (e.g. Bt cotton, Golden Rice) carry a foreign gene; recombinant DNA is delivered into host cells by making them

8. Describe the structure of an ecosystem in detail.

Correct Answer: —

Solution:

Step 1: Overview:
An ecosystem has two broad components that interact with each other: abiotic (non-living) and biotic (living) components.

Step 2: Abiotic Components:
These include physical factors like temperature, water, light and soil, along with inorganic substances (carbon, nitrogen, phosphorus, water) and organic compounds (proteins, carbohydrates, lipids) that link the biotic and abiotic parts of the ecosystem.

Step 3: Biotic Component — Producers:
Producers (autotrophs) are green plants and blue-green algae that manufacture food from simple inorganic raw materials by fixing light energy through photosynthesis.

Step 4: Biotic Component — Consumers:
Consumers (heterotrophs) depend on producers for food and are subdivided into primary consumers/herbivores

(feed directly on plants, e.g. insects, birds, mammals), secondary consumers/primary carnivores (feed on herbivores), and tertiary consumers/top carnivores (feed on secondary consumers).

Step 5: Biotic Component — Decomposers and Stratification:
Decomposers (saprotrophs), mainly bacteria and fungi, break down complex organic compounds of dead organisms and release nutrients back for reuse by producers. Ecosystems also show stratification — the vertical distribution of different species occupying different levels, such as trees, shrubs and herbs arranged at different heights in a forest.

Final Answer:
An ecosystem's structure = abiotic components + biotic components (producers, consumers, decomposers), often arranged in vert

OR

What is productivity? What is its importance in an ecosystem?

Correct Answer: —

Solution:

Step 1: Definition:
Productivity refers to the rate of production (or biomass accumulation) of organic matter per unit area over a given time period, mainly through photosynthesis by producers.

Step 2: Gross and Net Primary Productivity:
Gross Primary Productivity (GPP) is the total rate of organic matter production during photosynthesis. Since plants also use some of this in respiration (R), the Net Primary Productivity is NPP = GPP - R, which is the biomass actually available for consumption by heterotrophs (herbivores and decomposers).

Step 3: Secondary Productivity:
Secondary productivity is the rate of formation of new organic matter by consumers, through their use of the food/biomass provided by primary producers.

Step 4: Importance in the Ecosystem:
Productivity forms the basis of energy flow through an ecosystem, determining how much energy or biomass is available at each successive trophic level. It depends on the plant species present, environmental factors (nutrient, water and sunlight availability), and the photosynthetic capacity of the vegetation, and it helps in assessing the total biomass/yield available for human use, such as in agriculture and forestry, and the carrying capacity of the ecosystem.

Final Answer:
Productivity is the rate of biomass production; it drives energy flow and determines the biomass available at each trophic level

9. Describe the life-cycle of Plasmodium with a diagram.

Correct Answer: —

Solution:

Step 1: Overview — A Digenetic Parasite:
Plasmodium, the malarial parasite, has a digenetic life cycle requiring two hosts: the female Anopheles mosquito, which is the definitive host (where the sexual phase, sporogony, occurs), and humans, the secondary/intermediate host (where the asexual phase, schizogony, occurs).

Step 2: Phase in Humans — Liver Stage:
When an infected female Anopheles mosquito bites a human, it introduces sporozoites into the bloodstream. These sporozoites travel to and infect liver cells, where they multiply asexually (exo-erythrocytic schizogony) to produce large numbers of merozoites.

Step 3: Phase in Humans — Blood Stage and Symptoms:
The released merozoites enter red blood cells (RBCs) and multiply further, eventually rupturing the RBCs to release more merozoites along with a toxic substance called haemozoin. This synchronised rupture of RBCs is responsible for the characteristic recurring chills and high fever (the malarial paroxysm), which recurs periodically (e.g. approximately every 48 hours for Plasmodium vivax).

Step 4: Formation of Gametocytes:
Some of the merozoites, instead of continuing the asexual cycle, develop into male and female gametocytes within the RBCs.

Step 5: Phase in the Mosquito:
When a female Anopheles mosquito bites the infected human and takes up blood containing gametocytes, these develop into gametes in the mosquito's stomach, undergo fertilisation to form a zygote, which becomes a motile ookinete. The ookinete penetrates the stomach wall and forms an oocyst, inside which sporogony occurs, producing numerous sporozoites; these migrate to the mosquito's salivary glands, ready to infect a new human host at the next bite, completing the cycle.

Final Answer:
Plasmodium's digenetic cycle: sporozoites → liver schizogony → RBC schizogony (causing fever) → gametocytes → mosquito's sexual stage → new sporozoites

OR

Write an essay on the importance of microbes in household products.

Correct Answer: —

Solution:

Step 1: Introduction:
Microbes such as bacteria, yeast and fungi are widely used in the preparation of a variety of common household food and other daily-use products, enhancing their taste, texture, nutritional value or preservation.

Step 2: Curd and Fermented Foods:
Lactic Acid Bacteria (LAB), such as Lactobacillus, convert milk into curd; besides improving flavour and texture, this also significantly increases the Vitamin B12 content of the milk.

Step 3: Dough Fermentation:
The yeast Saccharomyces cerevisiae (baker's yeast) is used to ferment dough, producing carbon dioxide bubbles that cause the dough to rise (leavening), used in making foods such as bread, idli, and dosa.

Step 4: Cheese Production:
Different bacteria give distinctive flavours and textures to different cheeses; for example, the large holes seen in 'Swiss cheese' are produced by the bacterium Propionibacterium sharmanii, which releases large amounts of carbon dioxide gas during fermentation. The fungus Penicillium roqueforti is used to ripen 'Roquefort cheese', giving it its characteristic flavour.

Step 5: Toddy and Other Uses:
Toddy, a traditional fermented beverage, is produced by fermenting the sap of palm trees using yeasts. Enzymes derived from microbes are also incorporated into household products like toothpaste and detergents for their specific catalytic action.

Final Answer:
Microbes are essential in producing curd, leavened bread/idli-dosa, distinctively flavoured cheeses, and fermented beverages like t