

(a)

(i) Pollination: Transfer of pollen from the anther to the stigma

(ii) Self: Pollination which occurs within the same plant

Cross: Pollination which occurs between different plants

(b)

(i) A: Anther

B: Filament

C: Stigma

(ii) Stamen/Stigma exposed or light pollen

(iii) A

1. Diploid ($2n$) microspore mother cell divides by meiosis
2. 4 haploid (n) cells (tetrad) produced
3. Each cell divides by mitosis
4. Two nuclei formed: generative nucleus (n) and a tube nucleus (n)

(iv) 1st fertilization: Male nucleus fuses with egg cell to form a diploid zygote

2nd fertilization: Second male nucleus fuses with 2 polar nuclei to form a triploid endosperm

(c)

(i) 1- Cotyledon: A seed leaf

2- Stores food/ Supplies nutrients for embryo

(ii) Testa: Protection of seed

Plumule: Develops into young shoot

Radicle: Develops into young root

(iii) 1- Wind/ animal/ water/ self

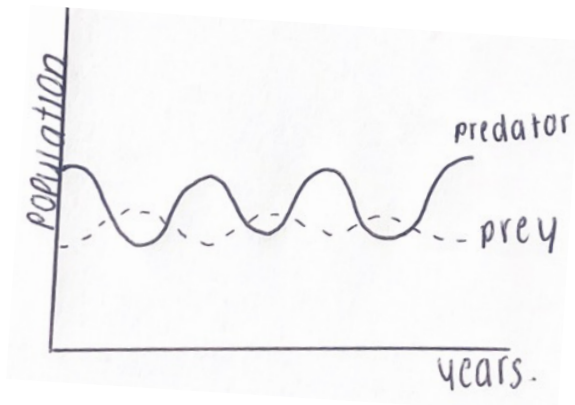
2- Increases the chance of survival/ reduces competition among plants/ eliminates overcrowding

(a) Ecology: The study of interactions between organisms and organisms and their environment

Biosphere: Anywhere life can exist on earth

Conservation: Preservation or protection of organisms and their environments

(b) (i)



(ii) Dashed line increases due to the availability of prey/food and decreases due to a lack of prey/food. There is a delay in the increase in predators due to the time it takes to breed. There is a lower number of prey due to the loss in energy

(iii) Population of prey increases as less predation occurs

(iv) Population control

(v) Lack of predation or healthcare availability

(c)

(i) 1- Seaweed

2- Salmon

3- Orca Whale

(ii) Producer: Organism that makes its own food

(iii) Phytoplankton → Zooplankton → Herring → Seal → Orca whale

(iv) 5

(v) Trophic level: Feeding stage in the food chain

(vi) Large amount of energy is lost between trophic levels

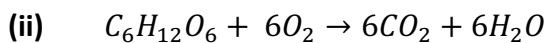
(vii) Pyramid of numbers

(a)

- (i) Metabolism: The sum of all of the chemical reactions in the body
- (ii) Anabolic: building large molecules from small molecules
Catabolic: Breaking down large molecules into small molecules

(b)

(i) Mitochondria



(iii) 1- Glycolysis

2-

- Glucose is broken down into pyruvic acid
- Low amounts of energy is released
- ADP joins with P to form ATP
- NADH is produced from NAD^+ , electrons ($2e^-$) and protons (H^+)

3- Picks up electrons and protons to form NADH which combine with O_2 to produce water

(c)

(i) Chloroplast

(ii) Chlorophyll

(iii)

- Electrons leave the chlorophyll
- They travel from electrons acceptor to electron acceptor,
- Releasing energy
- ADP joins with P to form ATP
- Electrons returns to the chlorophyll

(iv) Dark stage

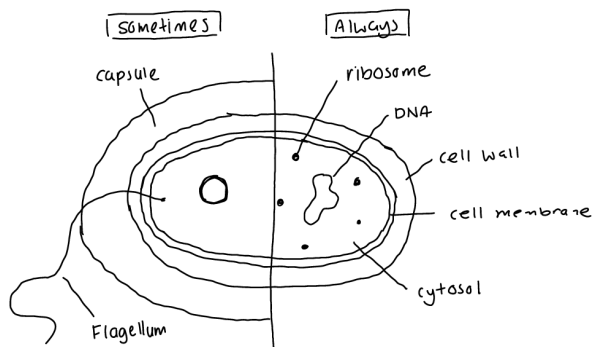
(v) 1- Carbohydrates

2- Water

3- Carbon dioxide

(a)

- (i) They can survive anywhere
- (ii) Asepsis: Absence of pathogens
Sterility: Absence of all microorganisms

(b)**(i)**

- (ii) Prokaryotic: They have no nucleus or membrane bound organelles

(iii)

Binary fission:

1. DNA replicates
2. DNA moves to either side of the cell
3. Cell elongates
4. Cell divides in two and two identical cells are formed

- (iv) Causes disease

- (v) Antibiotic resistance

(c)

- (i) They are non-cellular

- (ii) Protein and DNA/RNA

- (iii) Virus attaches to host cell, DNA replication and proteinsynthesis occurs, virus is assembled and released

- (iv) 1- Covid-19 or HIV

2- Vaccine production

(a)

- (i)** Species: A group of organisms that can interbreed to produce fertile offspring
- (ii)** Mutation/ sexual reproduction

(b)

- (i)** Allele: Specific form of a gene
Hererozygous: two different allele of a specific gene
- (ii)** TTRR and ttRr
- (iii)** Genotype: TtRR
Phenotype: Tall and red
Genotype: TtRr
Phenotype: Tall and pink
- (iv)** 50%

(c)

- (i)** Darwin and Wallace
- (ii)** Evolution: Genetic changes in a population over a period of time
- (iii)** Overbreeding occurs, there is a struggle for survival, the better adapted survive and reproduce while the others die out. The genes of the successful organisms have been passed on to the next generation which allows these organisms to dominate
- (iv)** Fossils

(a)

(i) 1- A: Urethra

B: Sperm duct

C: Prostate gland

2- A: Release urine

B: Carries sperm from testes to urethra

C: Produces seminal fluid

(ii) Testes

(iii) Penis

(iv) Cause: Low sperm count or testosterone levels

Corrective measure: IVF

(v) Natural/ chemical/ surgical

(b)

(i) X: Thyroid

Y: Adrenal

Z: Ovary

(ii) 1- Thyroid

Hormone: Thyroxine

Function: Controls the rate of metabolism

2- Adrenal

Hormone: Adrenaline

Function: Fight or flight response

3- Ovary

Hormone: Oestrogen

Function: Responsible for secondary sexual characteristics

(iii) Named hormone: Estrogen (Female)

1- Irregular periods/ weight gain

2- Fatigue/ headaches

3- Hormone replacement therapy

(iv) The concentration of ACTH stimulates the concentration of cortisol

(c)

- (i) Phototropism
- (ii) Allows for an increased rate of photosynthesis
- (iii) Geotropism/ chemotropism
- (iv) Growth regulator: Chemical that controls the growth of plants
- (v) Phototropic response regulated by IAA: IAA is produced at the tip of the shoot and travels down the shoot. When the plant is exposed to light, IAA is unevenly distributed, accumulating on the shaded side of the shoot. The higher concentration of IAA on the shaded side causes greater cell elongation compared to the side exposed to sun light. This unequal growth causes the shoot to bend towards the light.
- (vi) Seedless fruit or rooting powder
- (vii) Thorns/ bark/ guard cells/ heat shock proteins

(d)

(i) 1- Skin/ blood clotting/ fever/ tears

2- Tonsils/ spleen

(ii) 1- Antigen: Chemical that stimulates the production of antibodies

Antibody: Protein produced in response to an antigen

2- B lymphocyte

3- Helper T cell: Stimulate other immune cells to fight infections

Killer T cell: Destroy virus-infected cells

(a)

(i) 1- pH2

2- pH7

(ii) A: pH in the stomach is low/acidic

(iii) Active site of a base only matches one substrate this is known as specificity. Active site changed shape to fit substrate, enzyme-substrate complex is formed, products are released and active site reverts back to its natural shape

(iv) Amylase: Maltose

Lipase: Glycerol

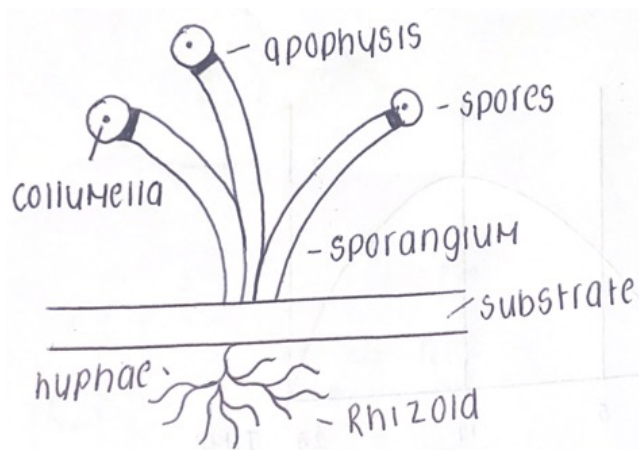
Protease: Amino acids

(b)

(i) Saprophytic: Organism that feeds off dead organic matter

Parasitic: Organism that feeds off another organism, causing them harm

(ii)



Spores: Sexual reproduction

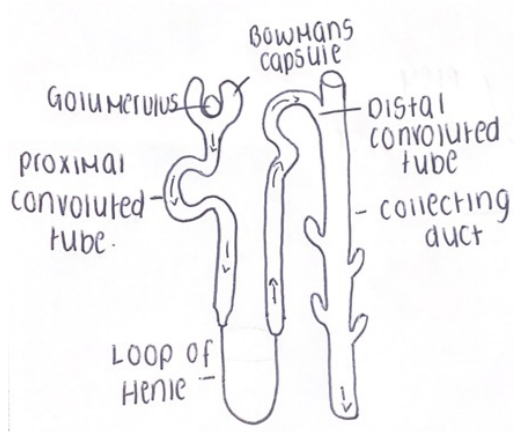
(iii) 1- Zygosporangium

2- Germination

(iv) Yeast, meadow waxcap (edible mushroom)

(c)

(i) Homeostasis



(ii)

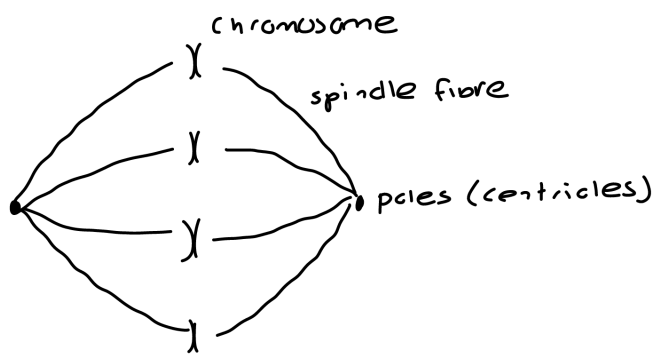
(iii) Blood contains blood cells, glomerular filtrate does not

(iv) 1- Proximal convoluted tubule/ distal convoluted tubule

2- Glucose/amino acids/minerals

(d)

- (i) Interphase
- (ii) DNA Replication, protein synthesis
- (iii) 1- Anaphase
2- Chromosomes are pulled apart
- (iv) Metaphase



(v)

- (vi) Growth and repair of tissue
- (vii) Cancer