- Enzymes are
- Enzymes reduce the activation energy.
- Reactions can take place at lower temperatures.
- Lock and key:
- Enzyme is the lock and substrate is the key.
- Enzyme has a 'dent' known as the active site.
- The shape of the active site is **complimentary** to the shape of the substrate.
- Enzyme and substrate bind at the active site to form a temporary structure known as enzyme-substrate complex.
- **Product** is formed.
- This product is no longer **complimentary** to shape of the active site, and so it is released.
- Enzyme can be used again. •
- Factors affecting enzyme activity:
- Temperature:
- At 0 degrees, enzyme activity is zero because molecules have very less kinetic energy.
- •
- Kinetic energy of molecules **increases**. •
- Number of collisions increase per unit time Otesale.co. Frequency of successful collisions
- •
- More enzyme-substrate domplexes formed. A OF 59 Enzyme activity incleases. •
- At optimum temperature, enzyme act vity is at the highest and enzyme functions • fastest.
- If temperature rises above the optimum temperature:
- The enzyme **denatures**. •
- Shape of active site **nolonger** complimentary to shape of substrate.
- Enzyme activity becomes **zero**. •
- pH: •
- Every enzyme has an optimum pH.
- Any pH less or more than that pH causes the enzyme to **denature**.
- Enzyme and substrate concentrations.

5] Plant Nutrition

- photosynthesis as the process by which plants manufacture carbohydrates from raw materials using energy from light.
- $6CO2 + 6H2O \rightarrow C6H12O6 + 6O2$
- Hydrogencarbonate indicator: used to measure carbon dioxide concentration in water.
- Importance of nitrates and magnesium ions.

\cdot Fatigue

• Reduced ability to absorb calcium ions.

- **Fibre** [found in any cereal, bread or green vegetable]: •
- stimulates muscles along the alimentary canal to contract and relax in order to perform 0 peristalsis.
- cannot be digested. 0
- adds volume to material in the alimentary canal. 0
- prevents (colon) cancer.
- absorbs fats / cholesterol in die. 0
- removal of bacteria,
- Prevents muscles from becoming weak and prevents constipation. 0
- Fats: saturated fat contains cholesterol. Cholesterol can get deposited on the walls of • coronary arteries and can lead to Found in <u>red meat and dairy products.</u> Notesale.co.
- Proteins:
- o deficiency can lead to <u>Kwashiorkor</u>. Symptoms:
- underweight •
- bloated stomach.
- A protein and energy deficient die fan lead to mar smar
 lack of growth
- lack of growth
- diarrhoea / yonitin •
- fatigu
- (more) prone to, infections / disease
- ingestion as the taking of substances, e.g. food and drink, into the body through the mouth.
- *mechanical digestion* as the breakdown of food into smaller pieces without chemical change to the food molecules. This increases the surface area and increases enzyme activity.
- chemicaldigestion as the breakdown of large, insoluble molecules into small, soluble • molecules.
- absorption as the movement of small food molecules and ions through the wall of the intestine into the blood. Uses protein carriers that transport molecules using energy from respiration against a concentration gradient in a process known as active transport.
- assimilation as the movement of digested food molecules into the cells of the body where they are used, becoming part of the cells.
- egestion as the passing out of food that has not been digested or absorbed, as faeces, through the anus.
- diarrhoea as the loss of watery faeces.
- Process:
- cholera bacterium releases a toxin, which attaches to the walls of the small intestine.
- stimulates the cells in the wall of the small intestine to release chloride ions.

- 7. **semi-lunar valves close** to prevent blood from flowing back.
- Function of valves:
- 1. prevent backflow of blood.
- 2. ensure that blood flows in one direction only.
- Function of septum:
- 1. to prevent mixing of oxygenated and de-oxygenated blood.
- Heart rate can be monitored by:
- 1. ECG[Electro Cardiogram].
- 2. pulse rate.
- 3. one 'lub-dup'; the sound of valves opening and closing.
- Coronary Heart Disease[CHD]
- caused by <u>deposition of fat and cholesterol on coronary arteries</u>.
- Process:
- deposition of **fat** on walls of coronary arteries. •
- narrows lumen, restricting blood flow[oxygen and glucose] to cardiac muscles.
- thrombosis may occur[complete blockage]. •
- •

- muscles cannot <u>contract as sufficientee contract as sufficientee contr</u> muscles cannot <u>contract as cufficient energy is not provided</u> <u>cardiac arrest/heart attack.</u> <u>Factors cauging CMS.</u> lack or exercise. •
- Factors causing CHO
- •
- high cholesterol diet. •
- genetic factors. •
- Prevention:
- exercise (regularly). •
- reduce / stop smoking.
- reduce (animal / saturated) fat / cholesterol in diet.
- lose weight / avoid obesity.
- reduce salt intake.
- reduce alcohol intake.
- avoid stress situations.
- correct ref to medication.
- control diabetes.
- reduce blood pressure. .
- How does exercise help?
- **prevents** blocked arteries / prevents thrombus formation. •
- . lowers blood pressure.
- lowers cholesterol / lowers fats / reduces risk of atheroma.
- weight loss / using fats / avoids obesity.
- lowersstress.

Excretion	Egestion
The removal of <u>toxic materials, waste</u> <u>products of metabolism and excess</u> <u>materials.</u>	Removal of <u>undigested or unabsorbed</u> food, and fibre.
Excreted through the <u>lungs, skin,</u> <u>kidneys and liver.</u>	Egested <u>through the anus.</u>
 Excretory organs: Lungs: carbon dioxide. Skin: excess salts and water. Kidney: excess salts and water. Liver: bile pigments. spent particles. deamination as the removal of the nitroge Process of deamination: nitrogen-containing part of excess amino ammonia is toxic and <u>it kills cells.</u> it is converted to urea and taken to the held. it is then taken from the heart to the kidned. remaining part of amino acids is converte Role of the liver: converts excess amino acids into urea and as deamination. synthesises plasma proteins such as fibrin stored carbohydrates as makes bile. neutralises toxins. breaks down old RBCs, <u>storing iron and en</u> stores vitamins A, B, D, E and K. stores cholesterol, for cell membrane rep 	An containing part of amino acids to form urea. acids is <u>converted to ammonia</u> , in the liver. eart <u>via the hepatic vein.</u> eys <u>via the renal artery.</u> d to glycogen and stored in the liver. d carbohydrates in a process known hogen from amino acids.

- cilia unable to remove it: mucus and smoke **collect** in the bronchial lining.
- **inflammation** of bronchial lining: bronchitis.
- smoker's cough.
- smoking and heart disease:
- nicotine and CO increase the tendency of blood to clot. •
- CO increases the rate of fat deposition on artery walls. .
- **blockage of coronary arteries** due to clots/fat deposits.
- **reduces** the supply of oxygenated blood to heart muscles. •
- heart failure.
- Anabolic steroids:
- steroid hormones include reproductive hormones: testosterone, oestrogen and progesterone.
- these hormones stimulate **anabolic reactions** that build up large molecules from small ones.
- they lead to:
- increase in bone density.
- increase in protein synthesis that can lead to increased recovery from muscle damage. •

- •

- asexual reproduction as a process resulting in the production of genetically identical • offspring from one parent.
- in plants, it is known as vegetative propagation: •
- o occurs in stem tubers.
- in bacteria, it is known as binary fission.
- Advantages of asexual reproduction to plants:
- only one parent required:**morechances** of offspring being propagated.
- faster adaptation: if parent plant is well adapted offspring will be well adapted also.
- less energy: no need to have flowers and nectaries as there is no need for pollinators.
- Disadvantages of asexual reproduction to plants:
- absence of genetic variation: offspring more susceptible to same disease.
- lesschancesofevolution.
- overcrowding leads to competition for resources.

Quantity of pollen.	Large amounts	Larger amounts.
Anther.	Inside the flower.	Hanging out/pendulous.
Stigma.	Inside flower; sticky.	Sticking out/pendulous; feathery.

- *pollination* as the <u>transfer of pollen grains</u> from the <u>anther to the stigma.</u>
- **self-pollination** as the <u>transfer of pollen grains</u> from the <u>anther of a flower to the stigma</u> of the same flower or different flower on the same plant.
- cross-pollination as transfer of pollen grains from the anther of a flower tothe stigma of a flower on a different plant of the same species.

Feature	September 10 in ation 38 of	B oss-pollination
Previo Variation.	Page V No.	Yes.
Capacity to respond to changes to environment.	Less compared to cross- pollinated because there is no variation. However, if parent plant is well adapted, offspring will adapt well also.	Variation leads to adaptability, disease resistance, more chances of evolution.
Reliance of pollinators.	Pollinators are not always required.	Requires pollinators. Energy needs to be invested in petals and nectaries.

- Fertilisation:
- 1. after landing on the stigma of a flower, pollen grains form a pollen tube.
- 2. pollen tube grows and **secretes enzymes** to digest a pathway **through the style**.
- 3. goes till ovary, and the pollen tube opens.
- 4. pollen nucleus travels down the pollen tube and enters at the micropyle.
- 5. pollen nucleus and egg cell nucleus
- 6. formation of a **diploid zygote**.
- After fertilisation:
- 1. diploid zygote à embryo plant[through mitosis].
- 2. ovule à
- 3. ovule wall à Testa [tough, protective covering].
- 4. ovary à
- 5. ovary wall à fruit skin.
- 6. sepal, petals, stamen, style, stigma àfalls off and withers away.
- Embryo:
- 1. plumule: forms **shoot**.
- 2. radicle: forms root.
- Testa: prevents embryo from damage and prevents bacteria and frage prom tering the 16] Reproduction in by mans Parts Ptho
- <u>Conditions for seed germination:</u>
- 1. Suitable temperature.

- nale reproductive Saten:
- 1. testes:
- produce
- make the hormone **testosterone[stimulates changes during puberty]**.
- 2. scrotum:
- sac that covers testes which hangs outside the body to keep it **cool** as sperm **cannot be** matured or stored at temperatures above 37 degrees Celsius.
- 3. epididymis:
- small tubules outside testes that store sperm for maturation. •
- 4. urethra:
- carries urine and sperm[not simultaneously].
- have a sphincter muscle to prevent urine loss during sex.
- 5. prostate gland[and other fluids]:
- secrete fluid for sperm to swim in. •
- prostate gland secretes **mucus** and others secrete **sugarsfor respiration** for sperm cells.
- 6. penis:
- urethra runs down the centre of the penis. •
- main function is to **deliver sperm to vagina for fertilisation**.
- Parts of the female reproductive system:

- genemutation as a change in the base sequence of DNA.
- **new** alleles are formed **by mutation**.
- they are the **only** source of new characteristics in a gene pool. Genetic variations are caused solely by mutation.
- mutations are caused by:
- ionising radiation.
- Sickle cell anaemia: •
- Caused by:
- change in DNA base sequence from CTT à CAT [single base substitution]. •
- mRNA code changes from GAA à •
- amino acid sequence changes from GLUTAMATE à
- people can inherit the allele for sickle cell anaemia, which is either in homozygous recessive combination [HbS HbS] or heterozygous combination.[HbS HbA]
- this change in base sequence of the gene for haemoglobin results in an **abnormal** • haemoglobin.
- red blood cells have sickle shape.
- the alleles for this disease are **co-dominant**.
- o symptoms:
- •
- •
- fewer normal RBCs. •

- Rewer normal RBCs. less efficiency in transporting oxygen fatigue, pain, exhaustion, due to capillaries being blocken sickle shaped and sickle shaped NFC: not being able to earry enough oxygen. •
- can let a to sickle cell crisis, which let ds to:
- damage to certain organs. .
- failure of certain organs. •
- slow
- reduced life span. •
- susceptible to infection.
- shortness of breath.
- chest
- fast
- headache.
- brittle .
- poor
- Malaria and sickle cell anaemia:
- malaria acts as an agent for natural selection for individuals who have the heterozygous genotype[codominant] of sickle cell anaemia.

Genotype

Result

- hygiene: better sanitation, sewage treatment, garbage removal, increase in awareness and information on importance of hygiene.
- personal hygiene: increase in awareness about healthy lifestyle.
- medicinal facilities: greater access to hospitals. .
- Increase in food supply:
- increase in land under cultivation. •
- moreefficientfoodproduction due to fertilisers/pesticides.
- **improved** food storage and distribution.

20] Biotechnology

- Bacteria are used in biotechnology because: •
- they are **small** and **easy** to grow in labs. 0
- they have **rapidreproductionrates**.
- they can form complex molecules. 0
- they have **no ethical concerns**. 0
- the genetic code is universal and can be shared with other organisms. 0
- they have plasmids [loops of DNA], which makes DNA easily transferrable 0 le.co.
- Yeast and biofuels: •
- Process:
- maize can be used as a crop in the process to make a •
- it is first treated with amylase to break down warch to glucose.
- then, yeast is added, and all the pluce of the gluce in the pluce of t
- ethanol is produced with his then extracted by fractional distillation. .
- <u>Advar</u>
- uses **renewable** and **sustainableresources**[plants] to make ethanol. 0
- even though carbon dioxide is released in the process, it can be taken in for growth by the plants used in the process for photosynthesis, reducing the amount of carbon dioxide added to the atmosphere.
- Disadvantages: •
- o does not contain as much energy per litre, so it is mixed with gasoline, to make fuel for vehicle engines.
- o crops that are used in the process take up space, which could have been used to growfood for people.
- using large quantities of maize and other crops **puts up their price**, making them **expensive** to other people.
- Making bread using ethanol: •
- to make bread, flour is mixed with water and yeast, making dough.
- **amylase enzymes** are also added to break down **starch to glucose**.
- the yeast then uses this glucose in aerobic respiration, producing carbon dioxide. 0
- the **bubbles of carbon dioxide** get trapped in the dough.
- gluten is stretchy, so the carbon dioxide bubbles cause the dough to rise.
- Biological washing powders: •
- contain less chemicals, which is good for sensitive skin.