Dai Jia cheng B8 09

Define diffusion
The net movement of particles from a region of higher concentration to a region of lower concentration down a conc. gradient

Define osmosis
The net movement of water molecules from a region of higher water potential to a region of lower water potential across a partially permeable membrane. Water potential is the measure of the tendency of water to move from one region to another region.

plasmolysis
↓
shrinkage of cytoplasm & C.M. away from the cell wall.

Define active transport
The process that uses energy to move particles across a cell membrane from a region of higher conc. to a region of higher conc. which is against conc. gradient

Discuss active transport's importance as an energy-consuming process by which substances are transported against a concentration gradient, as in ion uptake by root hairs and uptake of glucose by cells in the villi.
-In root hair cells, mitochondria are present to provide energy through aerobic respiration. This energy is used up for active transport for ions to be absorbed into the root hair cell despite the concentration of ions being higher in the root than in the surrounding soil.
-In villi, the concentration of glucose is higher in the villi than in the surrounding. Therefore active transport takes place to continue the absorption of glucose against the concentration gradient from the surrounding into the villi.

× diffuse
× affect w.p.

State the main roles of carbohydrates, fats, and proteins in living organisms:
- carbohydrates as an immediate source of energy
- fats for insulation and long-term storage of energy
- proteins for growth and repair of cells

starch + glycogen
↳ Insoluble in water + large molecule
↳ easily breakdown into glucose
↳ compact shape
↳ × reactive → × involve intracellular reaction

Describe and carry out tests for:
- starch (using iodine in potassium iodide solution)
If iodine turns from brown to blue-black, starch is present.
If iodine remains brown, starch is absent.

- reducing sugars (using Benedict's solution)
If the benedict solution remains blue, reducing sugars are absent.
If the benedict solution turns green, there are traces of reducing sugars
If the benedict solution turns yellow/orange, there are moderate amounts of reducing sugars
If the benedict solution has brick-red precipitate, there are large amounts of reducing sugars

- protein (using biuret solution)
If the solution remains blue, amino acids are absent
If the solution turns purple, amino acids are present
*Biuret test is to test for the peptide bonds between amino acids

- fats (ethanol emulsion) → 3 fatty acids & 1 glycerol
If solution remains clear, fats are absent
If solution turns white emulsion

Small intestine → villi → epithelial cells → (hv n) micro villi

Mitochondrion v.s. Chloroplast

aerobic respiration — photosynthesis

chemical potential energy → heat & kinetic energy — light energy → CPE

uses glucose & oxygen to provide CO_2 & H_2O — using CO_2 & H_2O to produce glucose & O_2

does not require light for reaction to take place — require light for reaction to take place

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Digestion

Mouth → physical digestion → chewing of food using teeth → ↑SA:V

→ chemical digestion → salivary amylase

Stomach → physical digestion → churning of food → ↑SA:V

hv pits
gastric gland → chemical digestion → protease: Protein → polypeptide
gastric juice ↳ HCl to provide optimum pH

Small intestine → physical digestion → bile salt emulsify fats

(duodenum ↓ jejunum ↓ ileum) → chemical digestion → pancreatic juice → alkaline → optimum pH

→ Hv pancreatic maltase, amylase & lipase & protease

→ Intestinal juice → maltase, protease & lipase
↳ by epithelial cell

Golgi body

2. Small vesicles containing subst. made by ER are pinched off from ER
2. ~~Has~~ vesicles fuse with golgi body & release their content into golgi body.
3. Subst. are chemically modified in G.B
4. Secretory vesicles containing modified subst. are pinched off from the golgi body
5. Move to the C.M. & fuse with it. Content are released out of the cell

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Antibodies produced by ~~hv~~ lymphocyte

↳ attaches to virus/bacteria/pathogens
↳ prevent move of pathogens around the body & entry of them into cells
↳ destroy pathogen
↳ neutralise toxins
↳ clump pathogens tgt
↳ help phagocytes engulf pathogens
↳ stop multiplication of pathogens

Effects of excessive alcohol consumption

Short term:
- ↓ self-control
- Depressant

long term:
- shrinkage in brain volume
- liver cirrhosis → liver failure

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mucus produced in small intestine
↳ lubrication
↳ barrier to bacteria
↳ neutralise acidic ~~chy~~ chyme

Assimilation: absorbed nutrients converted into new cytoplasm/ used to provide energy

State that large molecules are synthesised from smaller basic units:
- cellulose, glycogen, and starch from glucose
- polypeptides and proteins from amino acids
- lipids such as fats from glycerol and fatty acids

Describe peristalsis in terms of rhythmic wave-like contractions of the muscles to mix and propel the contents of the alimentary canal → churning in stomach
-Oesophagus — The circular muscles contract and longitudinal muscles relax at constricting areas of the oesophagus to push the food. The circular muscles relax and longitudinal muscles contract in dilating areas of the oesophagus (food)
-Muscles are antagonistic

State the function of the hepatic portal vein as the transport of blood rich in absorbed nutrients from the small intestine to the liver.

State the role of the liver in:
- conversion of glucose to glycogen and vice versa
- fat digestion
- metabolism of amino acids and formation of urea - assimilation
- breakdown of alcohol - detoxification
- breakdown of hormones
- conversion of ~~glycogen~~ glycogen to glucose in the presence of glucagen

*liver produces bile, stored in the gall bladder

deamination: amino grp → urea; acidic grp → carbon residue → glucose → glycogen

Outline the effects of alcohol consumption on the brain (e.g. increased reaction time, reduced self-control), the long-term effects of excessive consumption (e.g. liver disease and brain damage), and the social implications

liver cirrhosis

oxyhaemoglobin & Cabonyhaemoglobin

antibodies → small letter; Antigen → capital letter

State the components of blood and their roles in transport and defense:
- red blood cells – haemoglobin for oxygen transport
- plasma – transport of blood cells, ions, soluble food substances, hormones, carbon dioxide, urea, vitamins, plasma proteins
- white blood cells – phagocytosis, antibody formation, and tissue rejection
- platelets – fibrinogen to fibrin, causing clotting(thrombin)

soluble insoluble

Describe coronary heart disease in terms of the occlusion of coronary arteries (Atherosclerosis) and list the possible causes, such as unhealthy diet, sedentary lifestyle, and smoking, stating the possible preventative measures

↳ ↑risk of ↑bp ↳ build up of fatty solid. ↳ nicotine → ↑bp. → ↑chance of blood clot → ↑risk of coronary heart diseases

Systole -> contraction of heart muscles
Diastole -> relaxation of heart muscles

Define aerobic respiration in human cells
the release of energy by the breakdown of glucose in the presence of oxygen and state the equation, in words and symbols

~~Define anaerobic respiration in human cells~~

heart → Medium ~~Septum~~ septum, ventricles & Atria

Semilunar → 'dub' sound when closure

tricuspid valve → right
~~bicuspid~~ bicuspid valve → left
} 'lub' sound when closure

Arteries → thick muscular walls → withstand high pressure

→ thick & elastic walls → maintain ↑ pressure → efficient transport of blood

→ elasticity of the walls → enable it to be stretched & recoiled to push the blood forward

Vein → valves → prevent backflow of blood → ensure blood is returned to the heart efficiently

→ Skeletal muscle → pushes the blood forward to the heart
↳ contracting during vasoconstriction to ↓ bloodflow, & relaxing during vasodilation to ↑ bloodflow

→ thinner ~~layer~~ muscular layer → larger lumen → blood flow is slower & smoother towards the heart

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external nostril → Dust trapped in mucus

↓

nasal passage → air gets warm & moisture

↓

pharynx + epiglottis → ~~cut~~ control food/water entering

↓

trachea → epithelium cell → Gland cell → secrete mucus

→ ciliated cell → hair-like structure → sweep dust-trapped mucus

↓

Bronchi

↓

~~Cluster of alveoli~~

Bronchioles

↓

alveoli → ~~alveolo~~ alveolus

↳ numerous of it → ↑ SA

↳ one cell thick → ↓ diffusion dist.

↳ richly supplied with B.C → steep conc. grad.

↳ thin film of moisture → O_2 dissolves in

↳ elastic → can be stretched

↳ spherical shape → ↑ SA:V

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tobacco

↳ nicotine

↳ carbon monoxide

↳ Tar → causes uncontrolled cell division (cancer)

→ paralyses cilia lining in the air passage → dust trapped mucus ✗ remove

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Chronic Bronchitis (Prolong exposure to irritants)

↳ Effects

- Inflamed lining of bronchus secrete excessive mucus

↓

cilia ~~fall~~ lining paralysed

↓

dust trapped mucus ✗ remove

↓

blocked airway

↓

persistent coughing

↓

lung infection

Emphysema (Persistent & violent coughing)

↳ Effects

- breakdown of partition wall of alveoli

↓ SA

↓

↓ elasticity of lungs

↓

lung becomes inflated

↓

Breathing difficulties

↓

severe breathlessness

Chronic obstructive lung disease

↳ chronic bronchitis + emphysema

Pathogens → disease-causing organisms → e.g. viruses & bacteria

Define anaerobic respiration
the release of energy by the breakdown of glucose in the absence of oxygen and state the word equation

Define excretion[2014,2021]
The process of removing metabolic waste products and toxic materials from the body.[1m]
These waste products can be in the form of urine, sweat, carbon dioxide, and ~~feces~~ [1m] ta feaces
Excretion is essential for maintaining homeostasis and preventing the accumulation of harmful substances that could disrupt normal biological functions or death.
In humans and other animals, organs such as the kidneys, liver, lungs, and skin play crucial roles in the excretion process.

Define homeostasis[2017,2021,2022]
maintenance of a constant internal environment.[1] → pH also
which is a stimulus
When there is a change in the environment, a sequence of events known as the corrective mechanism, restores the internal environment back to its original state. This is known as the negative feedback process. [1]

Define a hormone → destroyed by liver after it has carried out its effect
A chemical substance, produced by a gland, carried by the blood, which alters the activity of one or more specific target organs

State that infectious(influenza, pneumococcus) diseases can be spread from person to person whereas non-infectious diseases cannot, and identify examples of each
flu, stuffy nose, sore throat & muscle aching, photophobia, vomiting, chest pain & rapid breathing, headache → fever, cough

State that a typical virus has a protein coat enclosing its genetic material and reproduces only in living host cells.
protein coat
genetic material

State that a typical bacteria cell has a cell wall and DNA without a nucleus; some are pathogenic and some non-pathogenic
flagellum
ribosome
cell membrane
genetic material
cell wall
plasmid

State that vaccines contain an agent that resembles a pathogen and prevents infectious diseases by stimulating white blood cells to quickly produce antibodies when the pathogen invades

State that chlorophyll absorbs light energy and converts it into chemical energy for the formation of carbohydrates and their subsequent uses. → P/S
↑ found in mesophyll cells of leave of plants

Define transpiration
Loss of water vapor from the aerial part of a plant, mainly through the stomata on the leaves

Define the term translocation as the transport of food (mainly sucrose) in the phloem tissue and illustrate the process through translocation studies(involving aphids, ringing experiment, radioactive isotopes) ***

A food chain represents energy transfer in an ecosystem[2015]
Each link/position in a food chain is called a trophic level[2015]

Osmoregulation is the control of w.p. & solute conc. in the blood to maintain a constant w.p. in the body.

Kidney – Nephron

Afferent arteriole → glomerulus (high hydrostatic pressure) → efferent arteriole

↓

Bowman's capsule

↓

Proximal convoluted tubule

↓

Loop of Henle

↓

Distal convoluted tubule

↓

Collecting duct

All A.a. & glucose reabsorbed + most mineral salt

Some mineral salt + water

Water

Dialysis machine

→ tubing → ppm → ✓ small molecules
→ long, narrow & coiled → ↑ SA : P

→ Direction of blood flows opp. to the flow of dialysis fluid
↳ ✓ conc. grad.

→ Dialysis fluid → same conc. of essential subst. as healthy blood
→ × metabolic waste

Body temp. & w.p. → hypothalamus

Blood glucose conc. → Islets of langerhans in the pancreas

Type 1 diabetes → Islets of langerhan × produce sufficient insulin

Type 2 diabetes → Target organs loss sensitivity to insulin

use insulin injection
or
type 2 : - ↓ carbohydrates take in
- Exercise regularly

→ Exocrine gland → got duct
↳ e.g. salivary glands → salivary duct

→ Endocrine gland → ductless → secrete directly into blood
↳ e.g. Pituitary gland

Both : Pancreas → pancreatic duct → pancreatic juice
↳ Islets of langerhans → Insulin & glycogen

→ reflex action : Immediate response to a specific stimulus without conscious control

Neurones

Central nervous system (CNS)

Sensory	V.S.	relay	V.S.	Motor
Found in sensory organs		Located entirely in CNS		Found in the CNS & extend to effector
Connect receptor to CNS		Connect sensory to Motor		Connect CNS to effector
long		Short		long
hv nerve fibre		dh nerve fibre		hv nerve fibre

Eye

→ Choroid → mid layer of eyeball
↳ pigmented black → prevent internal reflection of light
↳ contain B.V.

→ Iris muscle → radial & circular muscle
↳ light

→ Ciliary muscle + suspensory ligament + lens → distance of object

→ Rest of the parts of the eye refer to original notes

Length of circular muscles in ciliary body is shorter when it contracts ***
↳ vice versa for relaxation

Carbon sinks → an area that store carbon from the atmosphere for a long period of time. It stores > carbon than it release

State that DNA is a double helix comprising two strands of nucleotides, each nucleotide formed of a sugar, a phosphate group, and one of four different bases.
deoxyribose
State the rule of complementary base pairing
adenine (A) pairs with thymine (T), and cytosine (C) pairs with guanine (G)

State that each gene:
- is a sequence of nucleotides, as part of a DNA molecule
- codes for one polypeptide
- is a unit of inheritance

State that DNA is used to carry the genetic code, which is used to synthesise specific polypeptides.[2017]
made up of two anti-parallel polynucleotide chains/strands [1]
They twist to form a 3D double helical structure [1]
Basic unit is nucleotide. Each nucleotide made of a phosphate group, deoxyribose sugar and a nitrogenous base. [1]
The nitrogenous bases include adenine, thymine, cytosine and guanine.
Hydrogen bond forms between base adenine which complementary pairs with thymine and base guanine which pairs with cytosine[1]
Backbone is made up of phosphate and sugar covalently bonded.[1]

-Extract target gene (e.g. human insulin)
-Extract plasmid DNA (e.g. E. Coli)
-Use restriction enzymes to cut the target gene, use the same restriction enzyme to cut the plasmid DNA
-Attach the target gene to the plasmid DNA with DNA ligase
-Forms transgenic bacterium
-Place in fermenter (not in syl.)

Adv:
- only one parent
- ✗ fusion of gametes → ↑ probability
- All beneficial traits passed down
- offspring produced faster

Define asexual reproduction[2014,2017]
The process resulting in the production of genetically identical offspring from one parent

Mitosis
A type of cell division giving rise to genetically identical cells in which the chromosome number is maintained

State the importance of mitosis in growth, repair, and asexual reproduction

Adv:
- may inherit beneficial traits
- genetic variation

Define sexual reproduction[2015]
Sexual reproduction involves a process of fusion of nuclei of male and female haploid gametes to form a diploid zygote; Produces genetically dissimilar offspring; Gametes are produced by meiosis;

Define the terms haploid and diploid, and explain the need for a reduction division process before fertilisation in sexual reproduction

type 2 diabetes mellitus → persistently higher than normal blood due to the body's resistance to insulin or insufficient production of insulin

Vaccines

Step 1: WBC binds to the agent with the antigen of the specific pathogen
Step 2: WBC is stimulated to multiply
Step 3: WBC produce antibodies against it
Step 4: Agent is destroyed by the antibodies
Step 5: Some WBC remain in the blood
Step 6: when the real pathogen enters the person, the WBC will quickly produce large amt. of antibodies to de' attack & destroy the pathogens.

Antibodies

↳ Drugs used to treat bacterial infection
  ↳ made by microorganisms
  ↳ used to kill / inhibits the growth of bacteria
↳ Inhibits: - synthesis of bacterial cell wall
  ↳ weakened → expands, bursts & die
- cell membrane function
  ↳ break up C.M.
  ↳ ✗ protected & subst. can move in & out
- Protein synthesis in ribosomes
  ↳ ✗ growth
- Enzyme reaction in cytoplasm
  ↳ stop synthesis of folic acid that is needed for growth

Upper epidermis → secrete cuticle
  ↳ waxy → prevent excessive loss of water
  ↳ transparent → allow light to pass through
  → mechanical protection

palisade mesophyll → 1/2 layers of closely packed, long cylindrical cells
  → ↑ conc. of chloroplast → p/s

spongy mesophyll
  → Irregular shape of cells
    ↳ intercellular air spaces
  → fewer chloroplast
    ↳ absorb sunlight that was not absorbed
  → covered w a thin film of moisture
  → contains transport tissue → vascular bundle

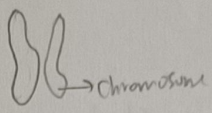
xylem → one direction
↳ water & mineral salts
↳ dead cells → ↓ resistance
↳ provide mechanical support → lignified

phloem → two direction
↳ manufactured food → sucrose + A.a. + Nitrates
↳ companion cell + sieve tube cell
  ↳ many mitochondria → active transport → translocation

Pollution

↳ The process by which harmful subst. are added to the environ., making it undesirable or unfit for life

Haf Harmful substances:
→ Sewage → eutrophication
→ Isecticides → Bioaccumulation & Biomagnification
→ non-biodegradable plastics
  ↳ harmful chemicals → poison
  ↳ block stomach & airway of animals → death



A haploid cell has a single set of chromosomes. In humans, haploid cells contain 23 chromosomes.
A diploid cell has two sets of chromosomes, one set inherited from each parent.
Maintaining Chromosome Number, Genetic Diversity

State what is meant by homologous pairs of chromosomes
Hv the same length, shapes, lengths, and genes but can hv diff alleles. Each pair consists of one chromosome inherited from the organism's mother and one from the father. Homologous chromosomes pair up during meiosis.

Meiosis
Type of cell division that gives rise to genetically dissimilar cells in which the chromosome number is halved due to the separation of homologous chromosomes. Meiosis is used in the formation of gametes

Explain,with reference to human blood groups, what is meant by codominance and multiple alleles.[2020]
Codominance occurs when two alleles controlling a trait both express themselves in an organism. In human blood group, IB allele and,IA allele are codominant. A person with IA IB genotype have both alleles expressed, giving rise to blood group AB [1].
Multiple alleles refers to a gene that consists of more than 2 different type of alleles that controls a specific trait/ phenotype [1]. In human blood group system, there are three alleles; IA , I B and IO which give rise to 4 different blood groups A, B, AB and O. [1].

Distinguish between the terms gene and allele
A gene is a unit of inheritance, born on a particular locus of a chromosome. A gene is a small segment of DNA in a chromosome that controls a particular characteristic or protein in an organism
Alleles are different forms of the same gene that occupy the same relative positions on a pair of homologous chromosomes.

describe mutation as a change in the sequence of a gene such as in sickle cell anaemia, or in the chromosome number, such as the 47 chromosomes in the condition known as Down syndrome(poor development,extra chromosome 21)[2017]

Gene mutation
-Sickle cell anaemia → RBC sickle-shaped (abnormal haemoglobin) → ✗ transport O_2 → fragile & sticky → stuck in narrow blood vessels → cause internal bleeding → blood clot
-Albinism

Chromosome mutation
-Down Syndrome (Trisomy 21) → "retarded development" fusion of one normal gamete & one gamete with two copies of chromosome 21
-Klinefelter Syndrome

Sex-linked
-No corresponding allele on Y chromosome to mask the effect on X chromosome.
-Male will manifest the trait even if only one recessive allele is present

Rate of mutation ↑ by:
- radiation such as x-ray, UV, α, β, γ
- chemical mutagens → Tar

Male reproduction system - human

- Testis → produce sperm & sex hormones
  ↳ e.g. testosterone
  ↳ develop & maintain secondary sexual characteristics
- Scrotum → ↓ temp → ✓ develop sperm
- prostate gland → secretes an fluid → ✓ enzyme & nutrients
  → mixed w sperm → semen → keep sperm active
- Penis → erectile organ → enter vagina

Female reproductive system - human

→ ovary → site of where egg mature
→ produce ~~oester~~ oestrogen & progesterone → ~~sex~~ female sex ~~horm~~ hormone

→ oviduct → site of fertilisation
→ hv cilia & muscle peristalsis

→ uterus → where embryo (→ after mitosis of zygote) implant & development of foetus
→ hv uterine lining → shed during menstruation
→ smooth elastic muscle contracts to push the child out during birth

Development of placenta

- Finger like projections called villi containing blood vessels from embryo, grow into uterine lining
- umbilical cord attaches the embryo to the placenta

maternal blood ✕ mix with foetal blood
↳ diff blood types
↳ mother's bp > foetus

Placenta

↳ produce o & p → maintain thickness
exchange:
↳ O_2 & nutrients diffuse from maternal to foetal capillaries
↳ metabolic waste produce
↳ antibiotics

umbilical cord

- bring oxygenated to placen foetus → umbilical vein
- bring ~~meta~~ metabolic waste products to placenta → umbilical artery

Mother-Son inheritance
-If mother have the condition, both her chromosomes carry recessive allele.
-Son will receive the X chromosome from Mother
-Hence receiving the condition

Sons do not inherit father's sex-linked trait
-Father passes their only X chromosome to their daughters and Y to sons
-Males only inherit X from Mothers

Suggest how rasiation and chemicals could influence the evolution of a population.
Radiation and certain chemicals like tar are mutagenic agents which cause mutation in a cell. When mutation occurs, there is a sudden random change in the structure of a gene or in the chromosome number [1].
Mutations can be :
-beneficial – genetic variation, passing down benefits to offsprings
-harmful – cystic fibrosis
-neutral

This leads to genetic variation and gives rise to new alleles within the population. [1]
Nature selects the individuals with beneficial traits to survive and when they reproduce, they pass it on to their offspring [1].
This leads to the evolution of new varieties and species of organisms after thousands and millions of generations.

Social and ethical implixations of genetic enginerring in animals
Social implications:
May cause allergies in humans/ Easier and cheaper to produce medicine + more affordable + more patients can get access to them and be treated/
Higher risk of contamination by disease-causing microorganism present in animals/ Loss of biodiversity due to drop in population of animals or plants/
May be toxic or cancer-causing + modifying a single gene could result in alteration of metabolic processes producing unwanted toxins/

Ethical implications:
Vegetarians or religious groups will object the use of medicine obtained from animals/
Morally wrong to exploit animals for medical researoh/
Deliberate creation of new combinations of genes that may be used in chemical or biological warfare/

Discontinous variation - Traits that show clear cut phenotypes with no intermediate forms between the traits
(e.g. Eye colour, type of ear lobes, dimples, eyelids)
- Not affected by environmental factors
- Controlled by one or few genes

Continous variation - Traits with phenotypes ranging from one extreme to the other.
(e.g. Skin colour, height, intelligence)
- Affected by environmental factors
- Controlled by many genes

Variation : Differences in traits between individuals of the same species

Development of ~~Amin~~ Amniotic Sac (same line as placenta)

↳ A.S. encloses the embryo in ~~amin~~ amniotic cavity which contains amniotic fluid → Supports & cushions foetus by absorbing shock
→ Allow movement → muscle development
→ ~~Lubr~~ Lubricate birth canal during childbirth
→ maintain constant temp.
↳ embryo develop into foetus

Modes of HIV transmitted
- unprotected sexual intercourse
- sharing of contaminated needles
- Blood transfusions
- passed from mother to foetus during prenancy

STIs can be prevented by:
- Abstinence
- only 1 sexual partner
- using condoms
- ✗ sharing needls / only use sterilised needles
- ✗ sharing of instruments that can poke through skins & contaminated with blood

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Plants' reproductive system

Stamen
→ anther → produce pollen grains
→ mature → splits → release PG
→ Filament → hold position
→ pollen grains (PG)
↳ Contain male gamates
↳ hv half the no. of chromosomes

Carpel
→ stigma → Receive pollen grains
→ Secretes sugary fluid to stimulate germination of PG when mature
→ style → Holds the stigma in position to trap PG
→ Ovary → contain ≥ 1 ovule
↓
contain female gamates (ovum)

- ~~Controlled by many genes~~

Natural selection
- Process that ensure the survival of the best adapted organisms or species in a population.
- Surviving organisms reproduce and pass down beneficial traits to offsprings → evolution

Artificial selection
- Method used by humans to producee plants and animals with desirable traits.

Evolution
- Process by which present complex forms of living organisms have risen from simpler ancestral forms.

Testis=>sperm duct=>urethra=>vagina=>cervix=>uterus=>oviduct

Similarities: → ~~form~~ for sperm & ovum
Both contain mitochondria which can carry out aerobic respiration to provide a large amount of energy for cell division, formation, and movement of the sperm cell
Both contain a nucleus that will fuse with the nucleus of the other opposite-sex gamete to form a zygote.
The sperm and egg are only made after puberty for both males and females.
Both contain half of the chromosome numbers from a respective parent.

Differences:
The sperm have a flagellum for it to swim towards the ovum while the ovum does not have a flagellum.
The ovum has a jelly coat as its outermost covering to prevent sperm from entering during fertilisation while the sperm do not have a jelly coat as its outermost covering.
The ovum has a spherical shape while sperm have an arrow-like shape
The sperm cell is much smaller than the ovum.
The ovum depends on the muscle in the oviduct and cilia cells in the oviduct but sperm use their own tails

Menstural cycle

DAY 1-5
Menstruation occurs
The uterus lining and eggs break down, releasing blood through the cervix and vagina out of the body
Progesterone remains constantly low
Oestergon starts to increase

DAY 6-9
Oestergon increase
Repairing of the uterus lining and thickening
The ovary is not prepared to realise a mature egg into the oviduct

DAY 10-15
The sperm cells can survive for ~~2-3~~ 3-5 days
Fertile period (conceive)

Insect-pollinated flower v.s. Wind-pollinated flower

	Insect-pollinated flower	Wind-pollinated flower
petal	Large (attract) brightly-coloured ↳ guidance	Small dull-coloured or absent
Stamen	× pendulous & × protrude out of flower	Pendulous (↳ hang down loosely) & anthers protrude out of flower
Stigma	Small & × protrude	- Large & feathery - ~~pendu~~ protrude out
pg	- less abundant - larger, heavier & rough	- more abundant - smaller, lighter & smooth
Nectar	Present	Absent
Nectar guide	present	Absent
Scent	Sweet-smelling	odourless

→ Fertilisation of plants

(1) PG germinates in response to the sugary fluid secreted by ms

(2) pollen tube grows out of each pollen grains & secretes enzymes that digest the stigma, style & ovary wall

(3) Pollen tube enters the ovule through micropyle

(5) within the ovule, the tip of pollen tube absorbs sap & bursts, releasing male gametes

(6) The nucelus of the male gamete fuses with the nucelus of the ovum to form zygote

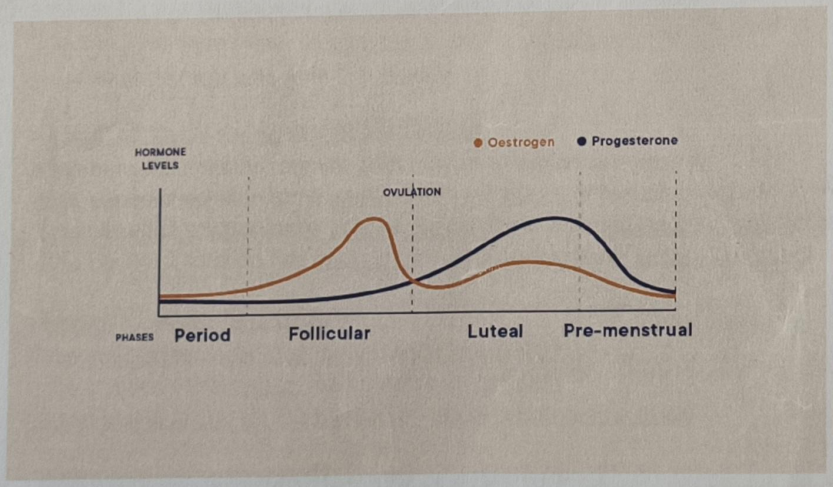
(7) After fertilisation, the ovary develops into the fruit & the ovule develops into the seed,

Increase in secretion of progesterone
↳Maintain the thickness of the uterus lining for potential fertilisation → preparing for implantation & growth of the embryo
↳Prevent another ovulation from taking place
secretion oestergon peak on day 12-13 and decreases
DAY 14
Ovulation is the release of the ovum into the oviduct by one of the ovaries. Ovum available for fertilization for 24 hours.

DAY 16-28
Increase in progesterone and increase in oestrogon again
The uterus lining thickens
Both hormones decrease in the later days if no fertilisation takes place, getting ready for the next menstruation cycle.
The secretion of progesterone and oestrogen remains constant and thus, the concentration of both hormones is maintained

If no fertilisation :
-Progesterone decrease → uterine lining sheds (menstruation)
-Oestrogen increase to repair uterine lining to prepare for another round of fertilisation
↳ lead to ovulation too
If fertilisation :
-Progesterone continues to increase, causing further thickening of uterine lining to prepare for implantation/embedding
-Embryo implants onto the unterine lining
-Utering lining thickens around embryo

Take note:
Progesterone only rise after 14 days
Oestergon will peak twice



Self pollination	v.s.	Cross pollination
transfer of PG from the anther to the stigma of the same flower/ from the anther of a flower to the stigma of another flower on the same plant		transfer of pollen grains from the anther of a flower to the stigma of a flower of another plant belonging to the same species
- Both anthers & stigma mature at same time - stigma directly below the anthers - flower rmv open		- only male/female flowers - anthers & stigma mature at diff. time - anthers & stigma located very far apart
- only one parent plant required - ✗ depend on external factors ~~of~~ for pollination - less pollen & energy are wasted - Beneficial qualities are more likely to pass down - ↑ chance of pollination to occur		- greater genetic variation - may inherit beneficial qualities from both parents - Seeds produced are more viable & capable of surviving longer before germination

disadv. are opp. of the each pollination

Bacteria play an active role in:
- breakdown of organic molecules
- production of methane
- reduction of phosphate levels in effluent

role of microorganisms in the treatment of sewage:
↳ to cause the anaerobic breakdown of organic materials in sewage sludge