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Adults live on land and have lungs

Reptiles

Scaly skin

Lay waterproof & scaly shelled eggs

(Limbs)

Birds

Have feathers

Forelimbs become wings

Lay hard shell eggs

Endothermic

Have a beak

Heart has four chambers

Mammals

Have hair

Have a placenta

Have mammary glands to feed young

Endothermic

Have a diaphragm

Heart has four chambers

Have four types of teeth

External eggs

Phylum Arthropods

Several pairs of jointed legs

Waterproof exoskeleton

Insects

Three pairs of legs

Two pairs of wings

Breathe through tracheae

Three body segments: head, thorax and abdomen

Crustaceans

> 4 pairs of legs

Breathe through gills

Antennae

Arachnids

4 pairs of legs

Breathe through gills called book lungs

2 body segments: head & thorax

No antenna

Myriapods

Many body segments

Tracheae

Each segment has legs

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Ch9 Transport in animals

Double circulatory system

Blood passes through the heart twice

In one complete circuit

Pulmonary system + systemic system

Adv

Raise pressure / flow rate of oxygenated blood before sending it off to the rest of the body

Allows different pressure in different loops

Prevents mixing of oxygenated and deoxygenated blood

Higher metabolic rate

Allows animals to be large

Dis

High energy cost

Reasons for difference in thickness of walls

Ventricles vs atria

Ventricles need to pump blood out of the heart

Atria only need to receive blood

Thicker walls in ventricles

Left vs right ventricle

Right ventricle only pumps blood to the lungs, close to the heart

Left ventricle pumps blood all around the body

Require high pressure to overcome resistance

Thicker walls in left ventricle to contain more cardiac muscle

Factors of CHD

Smoking cigarettes: cigarette contains nicotine

Diet: high in salt, saturated fat, cholesterol

Obesity

Stress

Genes

Treatment of CHD

Statin to reduce cholesterol levels in blood

Aspirin to reduce the risk of blood clots forming inside blood vessels

Coronary bypass operation: damaged coronary artery replaced with a length of blood vessel from another part of the body

Stent, a mesh tube to keep it open

Angioplasty: tiny balloon inflated by water to push artery open

Heart transplant: risk of rejection

Heart beat rate

Ch11 Respiration

Requirement of energy

Muscle contraction for movement

Anabolic reaction e.g. protein synthesis

Cell division to repair and grow

Active transport

Transmit nerve impulses

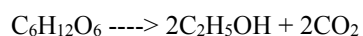
Sensitivity

Generate heat for thermal homeostasis

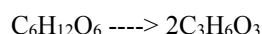
(transport in phloem)

Anaerobic respiration

Yeast and plants



Animals



Aerobic respiration	Anaerobic respiration
Uses O ₂	Does not use O ₂
No alcohol / lactic acid	Alcohol in yeasts & plants, lactic acid in muscles
Large amount of energy released	Much less amount of energy released
CO ₂ made	CO ₂ made only by yeasts and plants

Adaptation of nose to breathing

Nasal cavity is separated from oral cavity by palate to allow breathing during eating

Nasal hairs in nostrils trap dust particles in the air

On surface of turbinal bones

Goblet cells secrete mucus containing water and mucus to moisten and warm air

Cilia move mucus to the back of the throat

Adaptation of trachea to breathing

Supported by C-shaped cartilages

To prevent collapsing

To keep it open to allow free flow of air

To give it flexibility

Goblet cells and ciliated cells also present

At top

Epiglottis closes trachea when bolus touches palates and is about to be swallowed

Larynx containing vocal cords make sounds

Adaptation of alveoli to gas exchange

Thin walls to allow fast diffusion of O₂ molecules to blood

Ch13 Coordination and Response

Stimuli

- Changes in an organism's environment
- Sensed by receptor cells

Coordination

- The way in which receptors pick up stimuli
- Then pass information on to effectors to respond

Adaptation of neurones

- Axon: stretch out from the cell body to carry messages very quickly
- Dendrites: to pick up electrical signals from other neurones
- Myelin: insulate nerve fibres so nerve fibres carry impulses much faster

Involuntary actions / reflex action

- Automatic
- Fast
- Unconscious
- Innate / not learnt
- Conscious region of the brain not involved
- Stimulus always leads to the same response
- Very quick so fast response

Travel of nerve impulses

- At synapse: junction between two neurones
- Nerve impulses in presynaptic neurone arrives at nerve ending
- Ca^{2+} transporter opens and Ca^{2+} flows in cytoplasm
- Vesicles containing neurotransmitters move to synaptic cleft
- Vesicles fuse with cell membrane and release the contents by exocytosis
- Neurotransmitters diffuse through the cleft and bind to receptor molecules, complementary shape
- Triggers action potential at dendrites of postsynaptic neurone
- Nerve impulses in postsynaptic neurone

Sensory organs

- Groups of receptor cells
- Responding to specific stimuli
- Mechano-: mechanical pain
- Thigmo-: touch
- Thermo-: heat / temperature
- Hydro-: water
- Chemo-: chemicals
- Photo-: light

Binds to opioid receptors causing increased release of dopamine

Addiction due to the euphoria feeling, so withdrawal symptoms will develop if not taking it

Sleeplessness / insomnia

Fatigue

Hallucination

Muscle cramp

Nausea

Vomiting

Aggression

Rapid heart rate

Depressant

Slows down brain functions

Increase reaction time

Reduce self control

Reduces pain and breathing

Social problems

Addicted people lose the ability to be part of normal society

Unemployed

Criminal activities in order to obtain money to buy their next dose

Spread of pathogens e.g. HIV by needle sharing

Alcohol

Depressant

Slows down nerve impulses

Lengthens reaction time, so may cause more traffic accidents

Short-term effects

Blurred vision

Increase aggression

Unconsciousness, coma

Vomiting while unconscious, causing suffocation

Reduce self-control

Long-term effects

Addiction: alcoholism

Cirrhosis: damage to liver as fibres grow in the liver

Damage brain functions by osmotic water loss

Loss of memory

Confusion

Inhibits ADH secretion, a lot of dilute urine produced, dehydration

Cancer in tongue and oesophagus

Irritated intestines, causing indigestion, nausea, diarrhoea and ulcers

Anabolic steroids

Hormones e.g. testosterone, oestrogen and progesterone

Stimulate proteins synthesis, therefore muscle development

delivered wrongly	away and lost
Often have nectaries at the base of petals	No nectaries

Adv of self pollination (from the same flower, or same plant)

High chance of pollination / fertilisation --> fast growth of population

No need for agent of pollination

Little wastage of pollen

Little variation --> maintain advantageous features --> all plants adapt to the same environment

Useful if plants are isolated

Mutation will be the only source of variation

Mutation has a low chance to be expressed

Adv of cross pollination (different plants of the same species)

Lower competition, colonise new areas as seeds can be dispersed away

More genetic variation --> easy to evolve and adapt to changing conditions --> can have disease / pest resistant genes --> some of the population may survive from diseases / pests

Less chance of inherited disease

Reduce chance of extinction

Seeds can be dormant and survive through harsh conditions

Plant fertilisation

Pollen grain lands on stigma and begins to grow a tube

Pollen tube grows down the style

It moves down towards the ovule and secretes enzymes to digest a pathway through the style

Pollen tube grows through the micropyle, a hole surrounded by integuments, into the ovule inside ovary

Pollen nucleus enters the ovule and fuses with ovule nucleus a.k.a. fertilisation to form a zygote

Seeds

Zygote --> embryo

Integuments of ovule --> testa, it is hard to stop damage and entry of pathogens

Placenta (join to the ovary) --> hilum

Radicle to grow into a root

Plumule to grow into a shoot

Cotyledons contain starch and protein

Water drawn out to be dormant to survive harsh conditions e.g. cold & drought

Germination

Water enters, seed swells, bursts the testa

Amylase and protease started working

Ch17 Reproduction in human

Male reproductive system

Testes: make sperm(atozoa)

Scrotum: surrounds testes outside the body, lower temperature for sperm production

Sperm duct / vas deferens: carry sperm from the testes to urethra

Prostate gland: at where sperm ducts join the urethra, to make a fluid which sperm swim in

Sperm cell

Acrosome: a vesicle containing enzymes to digest the jelly coat surrounding the egg cell

Nucleus: contains the haploid nucleus

Mitochondria: carry out aerobic respiration to release energy for swimming

Flagellum: produce swimming movements

Human fertilisation and embryo development

Ovulation

The released egg is caught in the funnel-shaped opening of the oviduct (Fallopian tube)

The funnel has cilia which waft the egg into oviduct

Peristalsis to move the egg in the oviduct

Sperm reaches the egg

Ejaculation: sperm are pushed out of penis into the vagina in semen

Sperm travel up through the cervix through the uterus and into the oviduct

One sperm has its head enters the egg after acrosome digest the jelly coat, leaving tail outside

Fertilisation: nuclei fuse to form zygote

The egg membrane becomes impermeable / hardens, other sperm die

Implantation

Fertilised zygote divides by mitosis to form an embryo, a ball of cells

The embryo reach the uterus and sinks into the endometrium

Cell specialisation to increase complexity

After 11 weeks of fertilisation, all organs are developed, embryo --> fetus

Later development to increase size

Uterus

Placenta

Connects the embryo to the uterus wall

Exchange substances between mother's and embryo's blood by diffusion

Wastes to mother's blood

Nutrients to fetus's blood

Wall of it separates fetus's blood and mother's blood

Umbilical cord

Joins the fetus to the placenta

Amniotic fluid surrounded by amniotic sac

Protects the embryo from mechanical damage by lubricating

Supports it

- Maintains temperature
- Provides sterile environment
- Allows movement
- Swallow of certain nutrients in fluid

Ante-natal care

- Ca^{2+} in diet: to form the growing fetus's bones
- $\text{Fe}^{2+}/^{3+}$ in diet: produce a lot of extra Hb
- Extra carbohydrate: extra energy to move around heavier
- Extra protein: to form growing fetus's new cells

No smoking

- Nicotine & CO can enter the baby's blood
- Increase risk of miscarriage
- Cause the baby to grow more slowly
- Lower birth weight
- Fetus brain damage
- Increased risk of lung infection in infants
- Infants develop addiction

No alcohol

- Vaccinated with rubella virus in puberty
- Rubella can cross the placenta
- Cause the baby to born with deaf or other disabilities

Birth

Labour

- Strong muscles in the uterus wall start to contract
- Cervix dilates
- Vaginal wall stretch
- Amniotic sac breaks
- Amniotic fluid releases

Afterbirth

- Placenta falls away from the uterus wall and passes out through the vagina
- The umbilical cord is tied, cut and clamped and forms the baby's navel

Adv of breast feeding

- Contains antibody, passive immunity
- Creates bonding with mother
- No pathogens, less risk of infection
- Cheap
- Nutrient change with children development
- No preparation / convenient
- Easy to digest
- Less risk of allergic effect

It doesn't degenerate so quickly
Continues to secrete progesterone

Natural methods of birth control

Abstinence: mentally ineffective

Rhythm control

Predict menstrual cycle and avoid intercourse around ovulation, not reliable

Using body temperature monitoring & cervical mucus

Chemical methods

Spermicide

Not always reliable

Easy to use

Need to be used in combination with barriers

Sex hormones

Contains progesterone and oestrogen

Very effective

May forget to take it everyday

Side effects

IUD (intrauterine device)

Coil in uterus prevents implantation

No protection against STI

IUS (intrauterine system)

Slowly releases hormone to prevent implantation

Mechanical methods

Condom

Thin rubber covering over penis to prevent sperm entering the vagina

Safe & easy

Prevent STI

Femidom

Thin sheath lines the vagina to prevent entry of sperm

Diaphragm / cap

Circular slightly domed piece of rubber inserted into the vagina and covers the cervix

To stop sperm enter

Surgical methods

In man (vasectomy)

Sperm ducts are cut / tied

Stopping sperm from travelling from the testes to the penis

In woman (female sterilisation)

Oviducts are cut / tied

Stopping eggs from travelling down the oviducts

Effective

Ch20 Ecology

Ecology

The study of the interaction
Between living organisms
And their environment

Population

A group of organisms
Of one species
Living in the same area at the same time

Ecosystem

All of the organisms
And their environment
Interacting together in a given area

Community

All of the organisms
Of different species
In an ecosystem

Niche

The role of an organism in an ecosystem

Producers

Autotrophs
Make own organic nutrients
Carry out photosynthesis using energy from Sun
/ carry out chemosynthesis using energy from oxidation of chemicals

Consumers

Heterotrophs
Get its energy / nutrients by feeding on other organisms
Herbivore
Get energy from plants
1° consumer
Carnivore
Get energy from other animals
Higher level consumers
Omnivore
Get energy from both plants & animals

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