

Homeostasis

PROF. AYYAZ MEHMOOD
PGC SIALKOT



/azsbiology03



/azsbiology



/azsbiology

Homeostasis

MCQs

- Q1 A diluted solution compared to cell concentration termed as
- Hypertonic
 - Hypotonic
 - Isotonic
 - Paratonic
- Q2 The most concentrated external environment is called as
- Hypertonic
 - Hypotonic
 - Isotonic
 - Peritonic
- Q3 Hydrophyte possesses
- Small leaves
 - Large leaves
 - Stomata in depression of epidermis
 - Less water
- Q4 An example of mesophyte plant is
- Cactus
 - Hydrilla
 - Brassica
 - Water lily
- Q5 The stomata are located on the upper surface(epidermis) only in
- Hydrophytes
 - Mesophytes
 - Xerophytes
 - Epiphytes
- Q6 Fish retain which chemical that protect against urea
- Creatine
 - Xanthine
 - Hypoxanthine
 - Trimethylamine oxide
- Q7 Most cartilaginous fishes possess salt secreting organs known as
- Foetal glands
 - Caecal glands
 - Rectal gland
 - Sebaceous gland
- Q8 The animal which can survive without drinking water is
- Camel
 - Kangaroo
 - Kangaroo rat
 - Rat
- Q9 One of the following parts of the plant is / (serves as) excretophore
- Stem
 - Root
 - Leaves
 - Flower
- Q10 Metabolism of purines and pyrimidines produces
- Creatinine
 - Creatine
 - Xanthine
 - Trimethylamine oxide
- Q11 Sharks excrete nitrogen waste in the form of
- Ammonia
 - Uric acid
 - Urea
 - Allantoin
- Q12 Uric acid is produced from
- Amino acid
 - Nucleic acid
 - Fatty acid
 - Protein
- Q13 The excretory product that require minimum amount of water for its removal
- Urea
 - Uric acid
 - Ammonia
 - Creatinine
- Q14 Which nitrogen waste is very toxic and dissolves quickly in body fluid
- CO₂
 - Urea
 - Uric acid
 - Ammonia
- Q15 How much water is required to excrete 1g of ammonia nitrogen
- 400 ml
 - 500 ml
 - 600 ml
 - 700 ml

- Q16 Which one is least toxic
- Urea
 - Uric acid
 - Ammonia
 - Both a and b
- Q17 The excretory product that require maximum amount of water for its removal
- Urea
 - Uric acid
 - Ammonia
 - Creatinine
- Q18 The most toxic nitrogen waste is
- Ammonia
 - Uric acid
 - Urea
 - Creatinine
- Q19 Flame cells are part of excretory system of
- Cockroach
 - Earthworm
 - Hydra
 - Planaria
- Q20 Animals that excrete ammonia are
- Ureotelic
 - Ammonotelic
 - Uricotelic
 - Excretotelic
- Q21 Protonephridium is found in
- Cockroach
 - Earthworm
 - Hydra
 - Planaria
- Q22 Earthworm has tubular excretory system called
- Protonephridium
 - Prenepridium
 - Metanephridium
 - Mesonephridium
- Q23 Uric acid secreted out as solid excreta in
- Starfish
 - Earthworm
 - Planaria
 - Cockroach
- Q24 In cockroach, most of the reabsorption of water and salt takes place in the
- Intestine
 - Midgut
 - Rectum
 - Malpighian tubules
- Q25 Structural and functional relationship between nutritive tract and excretory system is seen in
- Planaria
 - Cnidarians
 - Earthworm
 - Insects
- Q26 Which organs is central station for metabolism
- Liver
 - Kidney
 - Spleen
 - Skin
- Q27 In urea cycle the detoxified form of ammonia is
- Urea
 - Uric acid
 - Ammonium ion
 - Nitrates
- Q28 The arginine is split by arginase to form urea and precursor
- Ornithine
 - Citrulline
 - Alanine
 - Arginine
- Q29 Number of molecules to produce one molecule of urea is
- 1
 - 2
 - 3
 - 4
- Q30 Major homeostatic function of liver is storage of
- Bile
 - Cholesterol
 - Urea
 - Iron
- Q31 Production of sweat and sebum is related to
- Skin
 - Liver
 - Lungs
 - Gills
- Q32 The central station of metabolism and body's metabolic clearing agent is
- Stomach
 - Kidney
 - Liver
 - Gut

- Q33 The end product of haemoglobin breakdown is
- Uric acid
 - Bilirubin
 - Creatinine
 - Citric acid
- Q34 Which one is not part of human urinary system
- Kidney
 - Ureter
 - Pubis
 - Renal Pelvis
- Q35 Urine leaves the kidney through duct called
- Urethra
 - Ureter
 - Renal Pelvis
 - Pubis
- Q36 Basic unit of excretory system in human is
- Ureter
 - Nephron
 - Renal pelvis
 - Urinary bladder
- Q37 Glomerulus circulates blood through capsule as it arrives through
- Vasa recta
 - Peritubular arteries
 - Afferent arteriole
 - Efferent arteriole
- Q38 Aldosterone plays role in
- Transport of water
 - Uptake of sodium in loop of Henle'
 - Transport of K ions into kidney
 - Reabsorption of water
- Q39 Sodium uptake in nephron is promoted by
- Cortisone
 - Aldosterone
 - ADH
 - FSH
- Q40 The incidence of calcium oxalate stone of kidney is
- 50 %
 - 60 %
 - 15 %
 - 70 %
- Q41 The incidence of calcium phosphate stone in kidney is
- 10 %
 - 15 %
 - 20 %
 - 30 %
- Q42 The incidence uric acid stone in kidney is
- 10 %
 - 5 %
 - 15 %
 - 70 %
- Q43 Non-surgical removal of kidney stone is called
- Lithotripsy
 - Kidney transplant
 - Dialysis
 - Radiotherapy
- Q44 The high level of renal failure is also called
- Uremia
 - Anemia
 - Sciatica
 - Death
- Q45 Increased plasma level of urea is an indication of
- Renal failure
 - Kidney stone
 - Hypocalcemia
 - Hyperoxaluria
- Q46 Abdomen has peritoneal cavity lined by thin epithelium called
- Peritoneum
 - Pericardium
 - Scrotal sac
 - Pleura
- Q47 Which one of the following is heterotherm?
- Bat
 - Frog
 - Snake
 - Man
- Q48 Bat does not regulate body temperature in a narrow range so it falls in category of
- Ectotherm
 - Endotherm
 - Heterotherm
 - Poikilotherm
- Q49 Which animal is not poikilotherm?
- Starfish
 - Frog
 - Tortoise
 - Parrot

- Q50 Bats and humming birds are called
- a. Ectotherm
 - b. Endotherm
 - c. Heterotherm
 - d. Poikilotherm
- Q51 The animals that generate own body heat by metabolism
- a. Ectotherm
 - b. Endotherm
 - c. Heterotherm
 - d. All of these
- Q52 Which of the following is structural adaptation of animals for thermogenesis?
- a. Pelage
 - b. Sweating
 - c. Plumage fluffing
 - d. Urination
- Q53 Lizard bask in sun to gain
- a. Heat
 - b. Cold
 - c. Air
 - d. Moisture
- Q54 Most of the mammals respond to cold by raising them
- a. Tail
 - b. Head
 - c. Furs
 - d. Legs
- Q55 The chemical substances responsible for raising human body temperature are
- a. Leukocytes
 - b. Pyrogens
 - c. Pyrexia
 - d. Pollutants
- Q56 During infection pyrogens are produced in human body by
- a. RBCs
 - b. WBCs
 - c. Platelets
 - d. Blood plasma
- Q57 In animals carbohydrates and lipids are metabolized to
- a. NH_3 and H_2O
 - b. NH_3 and CO_2
 - c. CO_2
 - d. CO_2 and H_2O
- Q58 The falling of yellow leaves in plants is to get rid of
- a. Accumulated waste
 - b. Old chlorophyll
 - c. Accumulated protein
 - d. Sap
- Q59 1g of ammonia requireml water for its removal
- a. 5
 - b. 50
 - c. 500
 - d. 1
- Q60 Trimethylamine oxide is produced in
- a. Hag fish
 - b. Reptiles
 - c. Amphibians
 - d. Cartilaginous fish

Short Questions

Q1 Define homeostasis what are its types

Homeostasis: Protection and maintenance of constant internal environment from harms and fluctuations of external environment e.g. maintenance of body temperature at 37°C

It is further divided into two types

1. Osmoregulation
2. Thermoregulation

Q2 What is difference between positive and negative feedback mechanism?

Positive feedback mechanism	Negative feedback mechanism
Mechanism in which effectors respond by enhancing original stimulus rather than reducing it	Mechanism in which effectors show inverse response to change in external environment i.e. stimulus
e.g. increase in level of oestrogen stimulates production of LH	e.g. receptors sense warmth temperature and effectors show response in form of cooling of body

Q3 Differentiate between hypotonic and hypertonic environment

Hypotonic environment / solution	Hypertonic environment
A dilute solution as compared to cell concentration	More concentrated external environment as compared to cell
Water moves into the cell from hypotonic environment	Water moves out of cell to hypertonic environment
Cell becomes turgid	The cell shrinks & becomes plasmolysed
e.g. freshwater environment like river, lake, pond etc.	e.g. marine water i.e. sea and ocean water

Q4 Differentiate between mesophyte and hydrophyte

Mesophyte	Hydrophyte
Plants living in moderate water land environment	Plants living in aquatic environment
Moderate number of stomata present on lower epidermis	High no. of stomata on upper epidermis of broad leaves
Normal rate of transpiration	Higher rate of transpiration
Cuticle is present on upper epidermis to prevent excessive water loss	Very thin cuticle
e.g. Rose, Brassica, Mango etc.	e.g. water lily, hydrilla etc.

Q5 How are xerophytes adapted

These are the plants adapted to low water land environment. Their adaptive features are

1. Possess small thick leaves
2. Thick cuticle layer to prevent water loss
3. Few number stomata present in depression that reduces transpiration rate
4. Can store water in fleshy stem

e.g. Cactus, Euphorbia, Aloe Vera etc.

Q6 Differentiate between osmoconformers and osmoregulators

Osmoconformers	Osmoregulators
Animals that do not require actively to adjust internal osmotic state	Animals that actively adjust their internal osmotic state to external environment
Animals keep their body fluid isotonic to external osmotic environment	Animals are either hypotonic or hypertonic to external environment
e.g. hagfish and marine invertebrates	e.g. bony fish and mammals

Q7 Give four adaptations of marine bony fish in its environment

Four adaptive features of marine bony fish are

1. It drinks large amount of sea water
2. Salt is actively secreted out by gills
3. It excretes concentrated urine
4. There is passive loss of water by gills so kidneys reabsorb more water

Q8 Define anhydrobiosis with an example

Anhydrobiosis: Ability of an organism to tolerate dehydration is called anhydrobiosis
e.g.

1. *Some desert animals like kangaroo rat survives without drinking water. It feeds on seed rich in carbohydrate to produce metabolic water.*
2. Terrestrial animals possess kidneys that help reabsorption of water
3. Some animals prevent water loss by having waxy exoskeleton like insects
4. Some animals have keratinized multi-layered skin

Q9 What are excretophores?

Excretophores: Excretophore are structures that are used by plants to remove waste. Leaves are used to excrete waste so leaves are called excretophores.

Plants produce certain organic and inorganic waste like pigments and salts which are stored in different organs and transfer it to leaves during autumn. Leaves shed off carrying waste along with. Change of leaf colour is due to stored waste pigments.

Q10 What is ebony and its role?

Ebony: It is dark black portion of the wood that is considered to deposit some waste chemicals. This portion of wood is no longer used for transport of food and water.

Q11 What is benefit of waste of plants?

Benefits of plant waste:

1. Some plant may use their waste against other competing plants e.g. conifers
2. Rotted autumn leaves are considered good source of minerals.

Q12 Why is ammonia more toxic than other nitrogen compounds?

Ammonia is more toxic than urea and uric acid because

1. It dissolves quickly in body fluids.
2. It is more reactive than urea and uric acid
3. It requires more amount of water for its removal 1g removal of ammonia require 500ml water which is not suitable for terrestrial animals.

Q13 Differentiate between ureotelic and uricotelic animals

Ureotelic	Uricotelic
Animals that excrete urea as major nitrogen waste are called ureotelic	Animals that excrete uric acid as major nitrogen waste are called uricotelic
They have restricted water supply	They have acute shortage of water
These animals require 50ml water for 1g of urea removal	These animals require 1ml water for 1g of uric acid removal
Relatively less efficient for water utilization	More efficient for water utilization
e.g. mammals, amphibians, shark, bony fish etc.	Insects, birds, reptiles, land snails etc.

Q14 What are flame cells and their role? / Why flame cells are called so?

Flame cells are excretory cells in tubular excretory system of Planaria. *Each cell consists of a tuft of cilia whose beating is like flickering flame hence called flame cell.*

Role: Beating of cilia propels/drives interstitial fluids into excretory tubules from where waste is removed through external excretory opening.

Q15 Differentiate between protonephridium and metanephridium

Protonephridium	Metanephridium
Nephridium without internal excretory opening. Only external opening is present	Nephridium with both internal and external excretory opening
Flame cell collects body fluids	Nephridiostome collects coelomic fluid
e.g. Planaria	e.g. earthworm

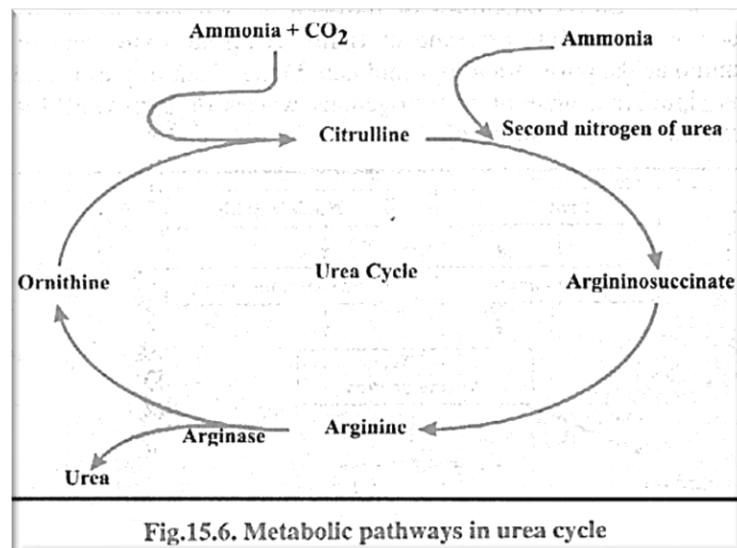
Q16 How Malpighian tubule take part in excretion

Malpighian tubules are suspended excretory tubular structures associated with nutritive tract in insects.

These tubules are adapted to collect excretory products like uric acid and salts from haemolymph in sinuses of insects. Waste is dragged into lumen of Malpighian tubules which is then passed to hindgut and removed along with faeces.

Increased surface area of tubules facilitated excretion.

Q17 Draw urea cycle



Q18 Write about urea cycle

The metabolic pathways involved in the production of urea are termed as urea cycle. Two ammonia and one carbon dioxide molecules are shunted into the cycle to generate one molecule of urea. One molecule of ammonia combines with carbon dioxide and **ornithine** (precursor) to form **citrulline**, another ammonia combines with citrulline to form **argininosuccinate** which yields **arginine**. Arginase splits arginine into **urea** and precursor ornithine for next cycle.

Q19 Name three plasma proteins synthesized in liver

Plasma proteins synthesized by liver are

1. Prothrombin – involved in blood clotting
2. Fibrinogen – involved in blood clotting
3. Albumin - maintains osmotic balance of blood

Q20 Write two storage functions of liver

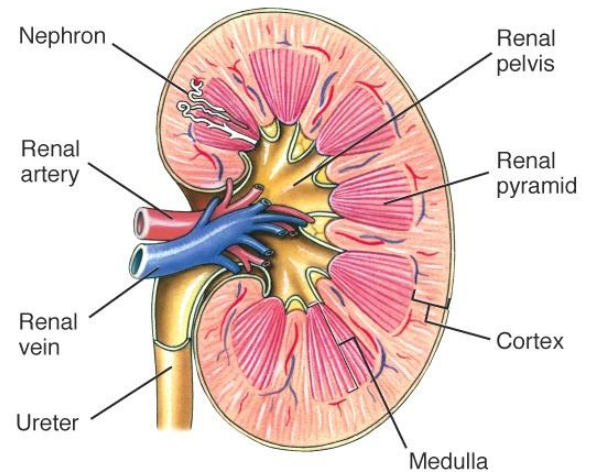
Liver is involved in the storage of

1. Iron – it is involved in oxygenation of tissue as it is major constituent of haemoglobin
2. Glycogen – Excess glucose in blood is converted into glycogen in liver which acts as energy reserve

Q21 Differentiate between ureter and urethra

Ureter	Urethra
It is a duct through which urine passes from kidney to urinary bladder	It is a duct through which urine leaves body from urinary bladder
Two in number	One in number
Only urine passes through it	It is passage of urine and also passage of sperms in males

Q22 Sketch the human kidney.



Internal structure of kidney

Q23 Differentiate between cortical and juxtamedullary nephrons.

Cortical nephron	Juxta-medullary nephron
Nephrons arranged along renal cortex are called cortical nephrons	Nephrons arranged along the border of renal cortex and renal medulla are juxtamedullary nephrons
Form less concentrated or dilute urine	Form more concentrated urine
Vasa recta is absent	Vasa recta is present

Q24 Explain briefly Glomerular Filtrate.

Glomerular filtrate: The filtrate appearing in Bowman's capsule is called renal filtrate. It is collected from blood circulating glomerulus. It contains nitrogen waste i.e. urea and uric acid along with some useful substances like glucose, salts, amino acids in aqueous solution.

Q25 Define counter current multiplier/ mechanism.

Counter current multiplier: Mechanism that expends energy to create concentration gradient. It causes gradual osmotic outflow of water from renal filtrate back to kidney tissue as it passes downward in the descending loop of Henle'.

Moreover, ascending loop of Henle do not allow water outflow instead it actively transport out sodium ion into kidney interstitium.

The interstitial fluid of kidney is concentrated with urea from cortical to medullary part through this mechanism

Q26 What is the role of hormones involved in nephrons working

Hormones responsible for the working of nephron are

1. **ADH** (Anti Diuretic Hormone) – secreted from posterior lobe of pituitary gland
Reabsorbs water, in descending loop of Henle and collecting tubule, by Active transport from filtrate back to kidney
2. **Aldosterone** – secreted from adrenal cortex
Reabsorbs salt, in thick portion of ascending loop of Henle, by active uptake of sodium.

Q27 What is hyperoxaluria? How is it caused?

Hyperoxaluria: It is a disorder in which there is higher oxalate level in blood. It contributes to the formation of calcium oxalate stone responsible for 70% of kidney stones.

Cause: It is mostly caused by metabolic defects or excessive intake of food containing oxalates

Q28 What is lithotripsy?

Lithotripsy: non-surgical removal of kidney stones using extracorporeal shock waves like X-rays or laser to break kidney stone into pieces. These broken pieces or sand is passed out of kidney by urine.

Q29 Define dialysis.

Artificial removal of body waste like excess water, urea and other nitrogen waste using dialysing fluid from blood or tissue fluid.

Q30 What is haemodialysis and peritoneal dialysis?

Haemodialysis	Peritoneal dialysis
Cleaning of the blood	It is cleaning of the body fluid
Blood is circulated through artificial dialyzer	Dialysing fluid is passed through peritoneum.

Q31 What are symptoms of kidney failure?

Symptoms of renal failure are:

1. High level of urea in blood
2. Increased blood pressure
3. Anaemia

Q32 What is uremia?

Uremia: It is end stage renal failure. At this stage dialysis cannot be done so surgical transplantation is the only option left. (For transplant of kidney donor's blood group and tissue chemistry must be a match to avoid tissue rejection).

Q33 Give two adaptations of plants to low and high temperature conditions.

Low temperature	High temperature
Plant cells secrete unsaturated fatty acid to prevent crystal formation in membrane	Plant cells secrete large quantities of special proteins called heat shock proteins . These proteins embrace enzymes to prevent denaturation of enzymes
Plants bring about changes in their composition of cell solutes that causes cytosol to supercool that prevent crystal formation in cytoplasm	Plants may also use evaporative cooling by regulating transpiration

Q34 What is difference between poikilotherms and homeotherms?

Poikilotherms	Homeotherms
Animals in which <i>body temperature tends to fluctuate</i> with environment where air or water temperature are changed	Animals that <i>maintain their body temperature</i> against changing temperature of environment
e.g. Invertebrates, fish, amphibians and reptiles	e.g. Birds and mammals

Q35 Differentiate between ectotherms and endotherms.

Ectotherms	Endotherms
Animals that produce own body heat at low level and exchange quickly with environment	Animals that generate own body heat by metabolism
May absorb heat from environment	Usually do not depend on environment for heat
Low metabolic organisms	High metabolic organisms
e.g. fish, amphibian and reptiles	e.g. mammals and birds

Q36 What are heterotherms?

Animals that produce own body heat but are capable of varying endothermic heat. These do not regulate body temperature in narrow range e.g. humming bird and bats

Q37 Differentiate between shivering thermogenesis and non-shivering thermogenesis.

These are both low temperature regulatory strategies in mammals

Shivering thermogenesis	Non-shivering thermogenesis
Increase in heat production by increased muscular activity which produces more metabolic heat	Increase in metabolic heat by mechanisms other than muscular activity i.e. by increased thyroid secretion <i>thyroxin</i>

Q38 How do brown fats and blubber help mammals in thermoregulation?

Brown fat (Brown Adipose Tissue): Some mammals possess specialized fat for rapid heat production called brown fat. Cells of brown fat consists of more mitochondria than white fat e.g. Infants of mammals

Blubber: *Marine mammals* inhabit much colder water environment than their body temperature so they have a very thick layer of insulating fat called blubber e.g. whales and seals

Q39 Write down thermoregulatory mechanism in bats and dogs.

Other than normal thermoregulatory strategies following animals have specialized mechanisms

Bats: Bats use saliva and urine for evaporative cooling in high temperature regulation

Dogs: Dogs carry out *evaporative cooling by rapid breathing through respiratory tract* called Panting

Q40 Which structure and Why is called thermostat in man?

Hypothalamus, a part of brain is called thermostat in man.

Reason: It is because hypothalamus like thermostat respond to change in temperature above or below set point i.e. 37°C and maintain this set point by either increasing or decreasing temperature to normal through different regulatory strategies like

- Shivering and non-shivering at low temperature
- Evaporative cooling and vasodilation at high temperature.

Q41 What are pyrogens and pyrexia?

Pyrogens: These are the chemicals produced by blood cells and pathogens that displace hypothalamus set point above normal 37°C . It happens during bacterial or viral infections when leucocyte and pathogen count increase

Pyrexia: It is condition that results from set point displacement above normal also called fever. Fever or high temperature helps in stimulating protecting mechanisms like immune response against pathogens.

Long questions

Q1 Discuss osmoregulation in plants

Q2 Define osmoregulation how do animals osmoregulate in different environments

Q3 Write note on osmoregulation in bony fishes

Q4 What are various adaptive features by which terrestrial animals regulate to external osmotic environment

Q5 Explain excretion in plants

Q6 Give an account of excretory system of cockroach/earthworm

Q7 Discuss major homeostatic functions of liver

Q8 Explain urinary system of man with help of a diagram

Q9 Explain structure of a nephron by drawing labelled diagram

Q10 Discuss functions of nephron in human body

Q11 Discuss kidney problems and their cure in human

Q12 Define dialysis and explain its types

Q13 Explain adaptations in plants to low and high temperature

Q14 Explain thermoregulation in mammals