

M1	(a) liver		1
	(b) insulin	<i>do not accept glucagon</i>	1
	(c) kidney		1
	(d) to replace water / ions / salt		1
	(that is) lost in sweat		1
			[5]

M2. (a) (i) (too) big 1

cannot fit / pass through filter / through (pores) in membrane / cannot be filtered
too big to be filtered = 2 marks

1

(ii) water 1

(iii) partially permeable 1

(b) any **two** from:

- hazards of operation / named eg
- may be rejected **or** need to use immunosuppressant drugs / long term drug use **or** transplant may need to be replaced
- susceptible to other infections
- shortage of donors
- high initial cost

2

[6]

- M3.** (a) (i) kidney 1
- (ii) bladder 1
- (iii) liver 1
- (iv) lung(s) 1
- (v) skin 1
- (b) (i) 3000
allow 2970 to 3030
correct answer gains 2 marks with or without working
if answer incorrect allow 1 mark for evidence of $1550 + 450 + 1000$ (allow tolerance of $+ \text{ or } - \frac{1}{2}$ square on each) 2
- (ii) 1600
allow 1570 to 1630 1
- (iii) 1400
allow (b)(i) – (b)(ii) 1
- (iv) correct plot from (b)(iii)
tolerance $\frac{1}{2}$ square ignore width 1

- (v) cells swell / overhydrated /
damaged
accept poisoned (by urea)

1
[11]

- M4.** (a) pancreas
allow phonetic spelling 1
- (b) (i) A 1
- shortest / quicker time (to work) 1
- (ii) D 1
- acts for longest time
mark dependent on D
allow D will last until 09.00 / breakfast / 24 hours 1
- (iii) diet / exercise
if 'diet' is qualified, then will need correct qualification, e.g.
'less carbohydrate / sugar'
accept pancreas transplant / stem cell treatment 1

[6]

M5.	(a)	(i)	water	1
		(ii)	small	1
		(iii)	3.15	1
	(b)	(i)	21 000	1
		(ii)	2 years	1
		(iii)	prevent rejection	1
				[6]

M6.(a) a higher concentration would be difficult to stir 1

(b) (i) methane 1

(ii) 60
100 - (5 + 35) but incorrect answer allow 1 mark 2

(c) (i) aerobic respiration 1

(ii) oxygen 1

[6]

- M7.** (a) pancreas
apply list principle 1
- (b) (i) protein
apply list principle 1
- (ii) any **one** from:
- (controlling / changing) diet
*accept sugar(y foods) / named eg
ignore references to starch / fat / protein / fibre*
 - exercise
accept example, eg go for a run
 - pancreas transplant
accept named drug eg metformin 1
- (c) (i) increase
ignore reference to women 1
- then fall 1
- relevant data quote (for male)
*eg max at ages 65–74 or starts at 10 (per thousand) or max at 130 (per thousand) or ends at 120 (per thousand)
accept a difference between any pairs of numbers in data set
accept quotes from scale eg '130' or '130 per thousand' but
not '130 thousand'; to within accuracy of +/- 2 (per thousand)* 1
- (ii) (between 0 and 64) more females (than males) **or** less males (than

females)

ignore numbers

allow eg females more diabetic than males

1

(over 65) more males (than females) or less females (than males)

allow eg males more diabetic than females

1

[8]

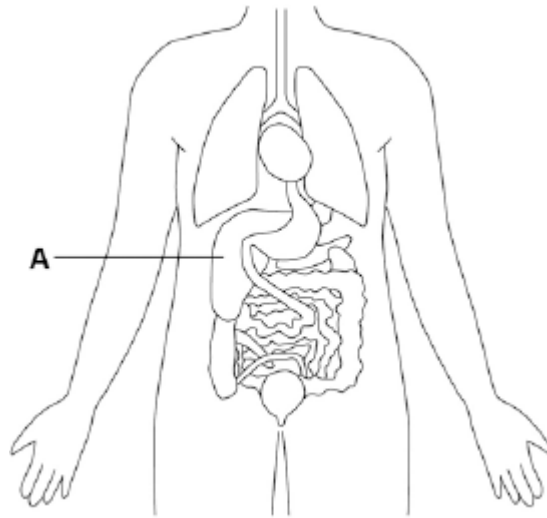
- M8.** (a) brain 1
in correct order only
- blood 1
- sweat 1
- (b) (i) A 1
- (ii) to replace ions lost (in sweat)
accept salts
allow named examples, eg. prevent cramps 1
- (iii) any **one** from:
- there is too much glucose / sugar in the sports drink
 - they shouldn't have too much glucose / blood sugar
 - it would cause their blood glucose / sugar to rise (too high)

1

[6]

Q1. Humans control their internal environment in many ways.

Look at the diagram below.



(a) Name organ **A**.

.....

(1)

(b) Organ **A** stores glucose.

People with Type 1 diabetes cannot effectively control the levels of glucose in their blood.

Name the **hormone** people with **Type 1 diabetes** have to inject to decrease their blood glucose level.

.....

(1)

(c) Which organ produces urine?

Tick **one** box.

Brain

Lungs

Kidney

Thyroid

(1)

(d) Marathon runners often drink sports drinks during a race.

Explain why.

.....

.....

.....

.....

(2)

(Total 5 marks)

Q2. Doctors use dialysis to treat patients with kidney failure.

The table shows the sizes of molecules of some of the substances found in blood plasma.

Substance	Size of molecule in arbitrary units
Water	18
Sodium ion	23
Urea	60
Glucose	180
Albumin (a blood protein)	68 000

(a) Use information from the table to answer the questions.

(i) Albumin is a blood protein. Albumin is **not** removed from the blood during dialysis.

Explain why.

.....
.....
.....
.....

(2)

(ii) During a dialysis session, one patient's body mass decreased by 2 kilograms.

This decrease was mainly due to removal from the blood of one of the substances in the table.

Which substance was this?

(1)

(iii) The substance you named in part (a)(ii) was able to pass through the dialysis membrane.

Draw a ring around the correct answer to complete the sentence.

The substance passed through because the

membrane was

impermeable.
partially permeable.
surrounded by capillaries.

(1)

- (b) For most patients, a kidney transplant is better than continued treatment using dialysis.

Kidney transplants have some disadvantages.

Give **two** disadvantages of kidney transplants.

1

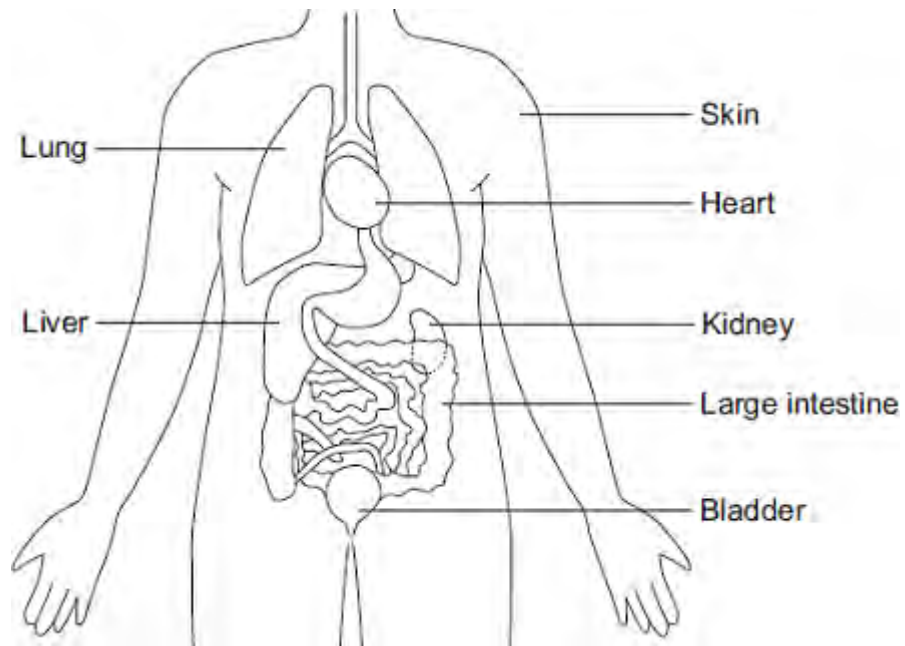
.....

2

.....

(2)
(Total 6 marks)

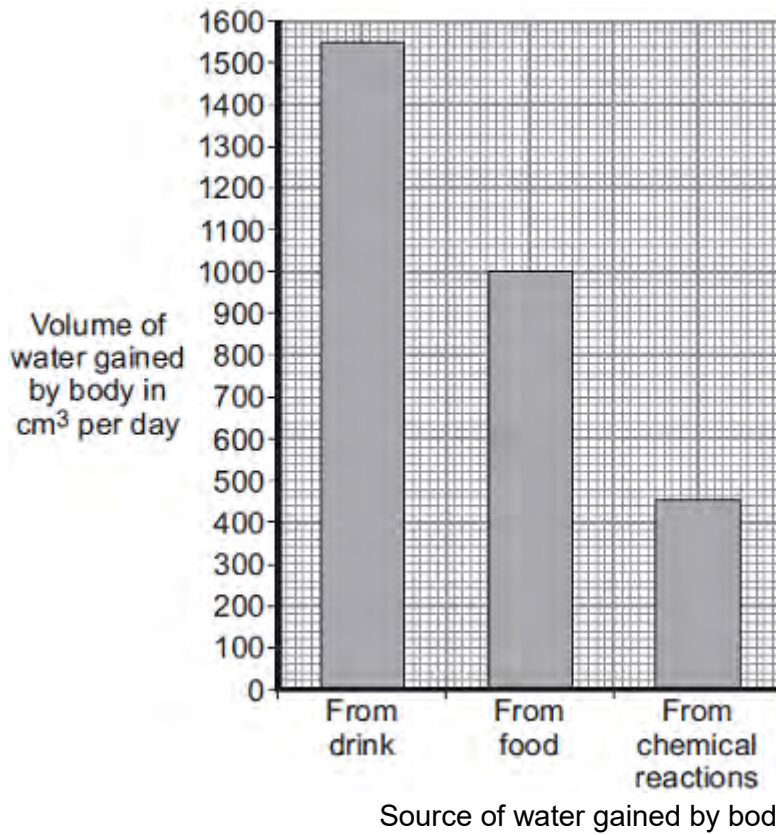
Q3.The diagram shows some of the organs of the human body.



- (a) Which organ labelled on the diagram:
- (i) produces urine (1)
 - (ii) stores urine (1)
 - (iii) produces urea (1)
 - (iv) gets rid of carbon dioxide (1)
 - (v) helps to control body temperature? (1)

(b) **Bar chart 1** shows the volume of water the human body gains each day.

Bar chart 1



- (i) Calculate the total volume of water the body gains each day.

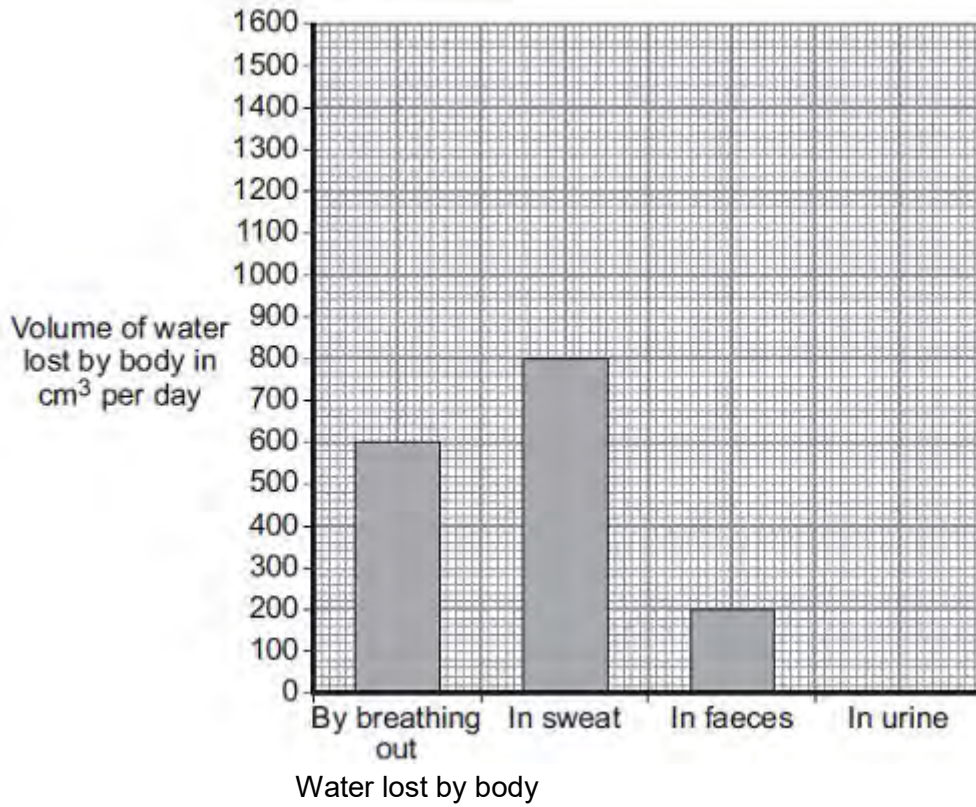
.....
.....
.....

Total volume of water gained = cm³

(2)

Bar chart 2 shows the volume of water lost each day by breathing out, in sweat and in faeces.

Bar chart 2



(ii) Calculate the total volume of water lost each day by breathing out, in sweat and in faeces.

.....

Volume = cm³

(1)

(iii) The volume of water the body loses must balance the volume of water the body gains.

Use your answers to part (b)(i) and part (b)(ii) to calculate the volume of water lost in urine.

.....

Volume of water lost in urine = cm₃

(1)

(iv) Plot your answer to part (b)(iii) on **Bar chart 2**.

(1)

(v) After taking some types of recreational drugs, the kidneys produce very little urine.

What happens to the body cells if the kidneys produce very little urine?

.....

.....

(1)

(Total 11 marks)

Q4. Type 1 diabetes develops when the body does not produce enough insulin.

- (a) Which organ produces insulin?

.....

(1)

- (b) One treatment for diabetes is to inject insulin.

The table gives the properties of four different types of insulin, **A**, **B**, **C** and **D**.

Type of insulin	Time taken for the insulin to begin to work in minutes	Time taken for insulin to reach maximum concentration in the blood in minutes	Time when insulin is no longer effective in hours
A	15-20	30-90	3-4
B	30-60	80-120	4-6
C	120-240	360-600	14-16
D	240-360	600-960	18-20

- (i) Some people with diabetes need to inject insulin just before a meal to stop a big increase in blood sugar concentration.

Which type of insulin, **A**, **B**, **C** or **D**, should these people with diabetes inject just before a meal?

.....

Give the reason for your answer.

.....

.....

(2)

- (ii) A person with diabetes is told to inject type **B** insulin immediately after breakfast at 09.00.

The person with diabetes is told to then inject a second type of insulin at lunchtime at 12.00.

The second type of insulin should keep the blood sugar level under control for the rest of the 24 hours.

Which type of insulin, **A**, **C** or **D**, should this person with diabetes inject at lunchtime?

.....

Give the reason for your answer.

.....
.....

(2)

(iii) Apart from injecting insulin, give **one** other way in which Type 1 diabetes can be controlled.

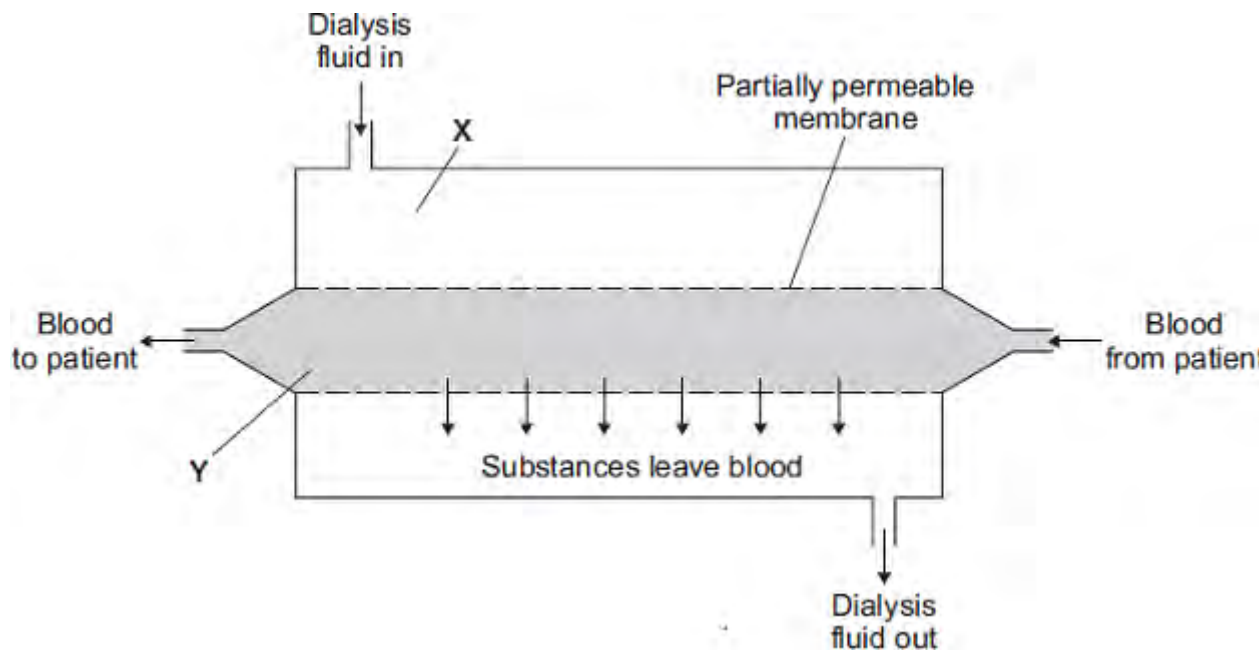
.....

(1)

(Total 6 marks)

Q5. People with kidney disease may be treated by dialysis.

The diagram shows a dialysis machine.



(a) Draw a ring around the correct answer to complete each sentence.

A person loses mass during dialysis. One patient lost 2.2 kilograms during a dialysis session.

(i) This person lost mass mainly because

- salt
- urea
- water

was removed from the blood.

(1)

(ii) This substance was able to pass through the partially permeable membranes

because its molecules are

- large.
- round.
- small.

(1)

(iii) The concentration of sodium ions at X is 3.15 grams per dm³.

At the end of a dialysis session, the most likely concentration of sodium ions

at Y would be

0.00
3.15
6.30

grams per dm³.

(1)

(b) The table shows the cost, in the UK, of treating one patient who has kidney disease.

Treatment	Cost per year in pounds
Dialysis	30 000
Kidney transplant: operation + first year's medical care medical care in each further year	51 000 5 000

(i) During the first year, dialysis treatment is cheaper than a kidney transplant.

How much cheaper is the dialysis treatment? pounds

(1)

(ii) After some time, the cost of treating a patient by a transplant operation would be cheaper than continual treatment by dialysis.

How many years would it take?

Draw a ring around **one** answer.

2 years

3 years

4 years

(1)

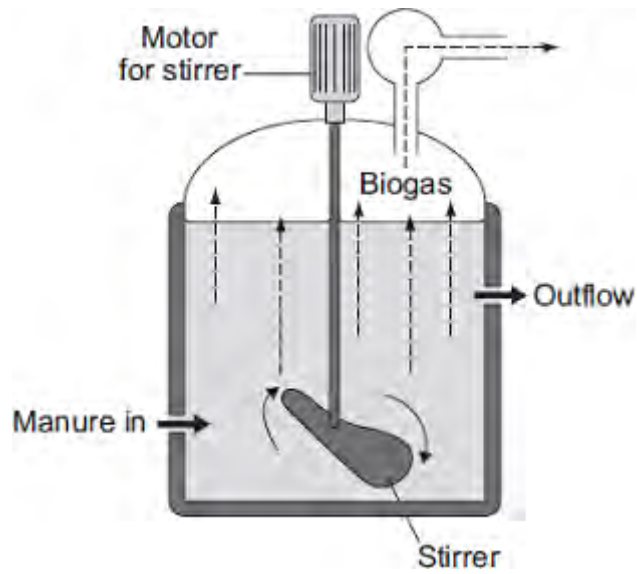
(iii) A transplant patient needs to take drugs for the rest of his life to suppress the immune system.

Why is it necessary to suppress the immune system ?

.....
.....

(1)
(Total 6 marks)

Q6. The diagram shows one type of biogas generator.



- (a) With this type of biogas generator, the concentration of solids that are fed into the reactor must be kept very low.

Suggest **one** reason for this.

Tick (✓) **one** box.

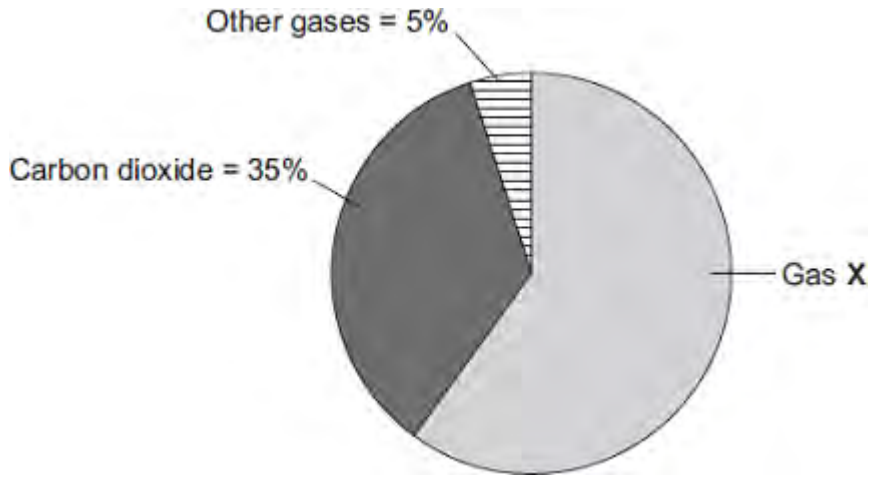
A higher concentration contains too little oxygen.

A higher concentration would be difficult to stir.

A higher concentration contains too much carbon dioxide.

(1)

- (b) The pie chart shows the percentages of the different gases found in the biogas.



Gas X is the main fuel gas found in the biogas.

(i) What is the name of gas X?

Draw a ring around **one** answer.

methane

nitrogen

oxygen

(1)

(ii) What is the percentage of gas X in the biogas?

Show clearly how you work out your answer.

.....

Percentage of gas X =

(2)

(c) If the biogas generator is not airtight, the biogas contains a much higher percentage of carbon dioxide.

Draw a ring around **one** answer in each part of this question.

(i) The air that leaks in will increase the rate of

aerobic respiration.

anaerobic respiration.

fermentation.

(1)

(ii) The process in part (c)(i) occurs because the air contains

ammonia.
nitrogen.
oxygen.

(1)

(Total 6 marks)

Q7.Diabetes is a disease in which the concentration of glucose in a person's blood may rise to fatally high levels.
Insulin controls the concentration of glucose in the blood.

(a) Where is insulin produced?

Draw a ring around **one** answer.

gall bladder

liver

pancreas

(1)

(b) People with diabetes may control their blood glucose by injecting insulin.

(i) If insulin is taken by mouth, it is digested in the stomach.

What type of substance is insulin?

Draw a ring around **one** answer.

carbohydrate

fat

protein

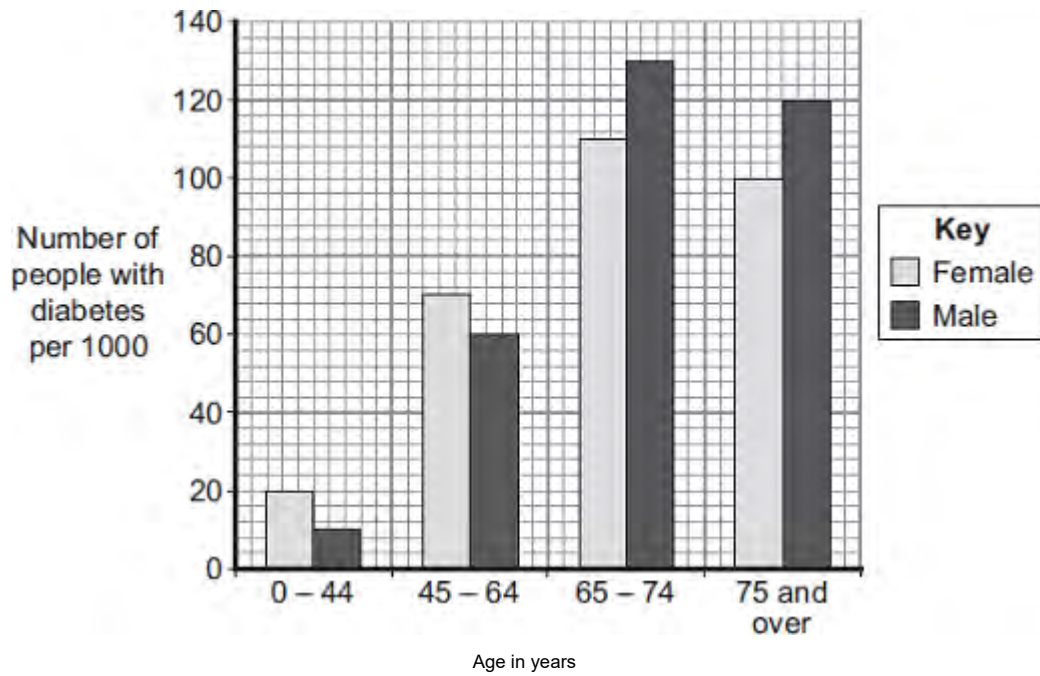
(1)

(ii) Apart from using insulin, give **one** other way people with diabetes may reduce their blood glucose.

.....

(1)

(c) The bar chart shows the number of people with diabetes in different age groups in the UK.



(i) Describe how the number of males with diabetes changes between the ages of 0 – 44 years and 75 years and over.

.....

.....

.....

.....

.....

.....

.....

.....

.....

(3)

(ii) Compare the number of males and females with diabetes:

between the ages of 0 and 64 years

.....

.....

.....

over the age of 65 years.

.....

.....

.....

(2)
(Total 8 marks)

Q8. Human body temperature must be kept within narrow limits.

The image shows a cyclist in a race.



© Ljupco/iStock/Thinkstock

(a) Use the correct answer from the box to complete each sentence.

blood	brain	kidney	sweat	urine
-------	-------	--------	-------	-------

The cyclist's body temperature is monitored by a centre in the

This centre is sensitive to the temperature of the cyclist's

If the cyclist's body temperature increases, his body increases

the production of

(3)

(b) (i) Cyclists drink sports drinks after a race.

The table below shows the ratio of glucose to ions in three sports drinks, **A**, **B** and **C**.

	Sports drink		
	A	B	C
Ratio of glucose (g per dm ³) to ions (mg per dm ³)	15:14	12:1	2:7

The closer this ratio of glucose to ions is to 1:1 in a sports drink, the faster the body replaces water.

Which sports drink, **A**, **B** or **C**, would replace water fastest in an athlete?

(1)

(ii) Why should sports drinks contain ions?

.....
.....

(1)

(iii) Why should a person with diabetes **not** drink too much sports drink?

.....
.....

(1)

(Total 6 marks)

M1.(a) detect changes in surroundings **or** detect stimuli
allow any named stimulus for skin

1

convert information to impulse
allow send impulse to sensory neurones / brain

1

(b) (i)

muscle	contract(ion)
gland	release / secrete / produce chemical / hormone / enzyme

1 mark for each effector
1 mark for each response
response must match type of effector (if given)
ignore examples
ignore relax(ation) / movement for contraction
*do **not** allow expansion for muscles*

4

(ii) any **one** from:

- (maintain temperature at which) enzymes work best
 - so chemical reactions are fast(est)
 - prevent damage to cells / enzymes
- allow prevent enzymes being denatured (by temperature being too high)*

1

[7]

M2. (a) Y - spinal cord / central nervous system / CNS

*do **not** accept spine*

ignore nerve / nervous system / coordinator

ignore grey / white matter

1

W - receptor / nerve ending

ignore sensory / neurone / stimulus

1

X - effector / muscle

allow gland

1

(b) any **two** from: eg

accept reverse argument for each marking point

- reflex action quicker
- effect of reflex action over shorter period
- hormone involves blood system and reflex involves neurones / nerve cells
ignore nervous system / nerves
- reflex involves impulses and hormone involves chemicals
- reflex action affects only one part of the body
ignore involves brain
ignore outside / inside stimuli

2

[5]

M3. (a) B

1

less / no insulin (produced) **or** insulin produced in pancreas
allow pancreas can't monitor (blood) sugar (level)
ignore pancreas can't control (blood) sugar (level)
allow increased glucagon production
allow A as liver stores less glucose / sugar for 2 marks only

1

(b) (i) (it / protein / insulin) digested / broken down
if ref to specific enzyme must be correct (protease / pepsin)
ignore denatured
*do **not** accept digested in mouth / other incorrect organs*

1

(ii) any **two** from:
ignore injections

- (attention to) diet
*accept examples, eg eat less sugar(y food) **or** eat small regular meals*
allow eat less carbohydrate / control diet
ignore cholesterol or balanced / healthy diet
- exercise
ignore keep fit / healthy
- (pancreas) transplant / stem cells / genetic engineering

2

[5]

- M4.** (a) (i) any **one** from:
- chemical messenger / message
allow substance / material which is a messenger
 - chemical / substance produced by a gland
allow material produced by a gland
 - chemical / substance transported to / acting on a target organ
 - chemical / substance that controls body functions
- 1
- (ii) gland / named endocrine gland
brain alone is insufficient
allow phonetic spelling
- 1
- (iii) in blood / plasma **or** circulatory system **or** bloodstream
accept blood vessels / named
*do **not** accept blood cells / named*
- 1
- (b) *each hormone must be linked to correct action apply list principle ignore the gland producing hormone*
- FSH stimulates oestrogen (production) / egg maturation / egg ripening
ignore production / development of egg
- 1
- oestrogen inhibits FSH
allow oestrogen stimulates LH / build up of uterine lining
- 1
- LH stimulates egg / ovum release / ovulation
accept LH inhibits oestrogen
accept LH controls / stimulates
growth of corpus luteum
ignore production of egg
- 1

M5. (a) (i) the lower the temperature the shorter the time
a trend is required
accept reverse

or

the lower the temperature the more chance of frostbite
accept the lower the temperature the faster you get frostbite
*accept positive correlation but **not** directly proportional*
ignore wind speed

1

(ii) any value from 5 to below 10
*do **not** accept 10*
*allow less than 10 **or** < 10*

1

(b) Muscles 'shiver'
if more than two boxes ticked deduct 1 mark for each additional tick

1

Blood vessels supplying the skin capillaries constrict

1

[4]

- M6.** (a) (i) **A** – pituitary
allow hypothalamus 1
- B** – ovary / ovaries 1
- (ii) in blood (stream)
accept in plasma
ignore dissolved 1
- (b) (i) FSH and Luteinising Hormone (LH) 1
- (ii) fertilised
OR
reference to sperm 1
- form embryos / ball of cells or cell division 1
- (embryo) inserted into mother's womb / uterus
allow (fertilised egg) is inserted into mother's womb / uterus 1
- (iii) any **one** from:
- multiple births lead to low birth weight
 - multiple births cause possible harm to mother / fetus / embryo / baby / miscarriages
allow premature

ignore reference to cost / ethics / population

1

(c) (i) any **one** from:

- almost identical
allow S (slightly) more successful
- both approximately 20%

1

(ii) larger numbers (in clinic R) (in 2007)
allow only 98 (in S) (compared to 1004 (in R))

1

results likely to be more repeatable (in 2008)
allow more reliable
*do **not** accept more reproducible / accurate / precise*

1

[11]

- M7. (a) (i) without oxygen
ignore reference to 'air' 1
- (ii) otherwise difficult to stir / to pump / to transfer
allow prevent 'clogging' owtte 1
- (iii) need to stir / pump / heat 1
- (b) (i) rises then falls 1
- then levels / slight rise 1
- quantitative descriptor
- e.g. to 80% / max. on day
4 / min. on day 16
accept other valid quantitative descriptor
allow accuracy $\pm \frac{1}{2}$ small square 1
- (ii) 16 (15.5 to 16.4) 1
- (c) any **two** from:
- oxygen present
 - (CO₂ produced) by aerobic respiration
or not much anaerobic respiration
 - **not** much methane / CH₄ produced

M8.(a) microorganisms

allow microbes / bacteria / fungi / decomposers

1

(microorganisms) respire

do not allow dead plants respire

1

(respiration / decay / microorganisms) releases (thermal) energy / 'heat'

ignore produce 'heat'

do not allow produce energy

do not allow dead plants release 'heat'

1

(b) (i) any **three** from:

- (opening) allows oxygen in
- microorganisms / eggs need oxygen
allow air for oxygen
- oxygen needed for respiration
- (opening) allows release of carbon dioxide (from microorganisms / respiration / eggs)
allow gaseous exchange (1 mark) of / for microorganisms / eggs (1 mark) if none of first four points given
- (opening) allows energy / 'heat' to escape
- (closing) retains energy / 'heat' if too cool / at night
if no mark awarded for either of these points allow 1 mark for vents open in the day to prevent overheating and close at night to prevent it getting too cold
- (closing) retains moisture
allow (opening) releases moisture

3

(ii) any **one** from:

- maintains sex balance
e.g. equal / best / correct numbers of male and female
- (survival of species depends on there being) males and females in population

allow so the offspring are not all the same sex

1

[7]

M9. Marks awarded for this answer will be determined by the Quality of Communication (QC) as well as the standard of the scientific response. Examiners should also apply a 'best-fit' approach to the marking.

0 marks

No relevant content.

Level 1 (1 – 2 marks)

There is a description of thermoregulation **or** at least one correct mechanism (skin, sweat glands or muscles) but roles may be confused.

Level 2 (3 – 4 marks)

There is a description of thermoregulation **or** some correct mechanisms (sweating, shivering, blood flow in the skin).

Level 3 (5 – 6 marks)

There is a clear description of thermoregulation by TC or skin **and** some correct control mechanisms.

examples of biology points made in the response:

full marks may be awarded for detailed description of what happens if the core temperature is either too high or too low

- temperature receptors in TC
- the TC detects (core) body / blood temperature
- temperature receptors in the skin send impulses to the TC, giving information about skin temperature
- if the core body temperature is too high: blood vessels / arterioles supplying the skin capillaries dilate / vasodilation

***do not** accept refs to veins instead of arterioles or answers that imply blood vessels have moved up / down through the skin.*

- so that more blood flows (through the skin) and more heat is lost
- sweat glands release more sweat to cool the body
- by evaporation
- if the core body temperature is too low: blood vessels supplying the skin capillaries constrict
- to reduce the flow of blood (through the skin) and less heat is lost
- *allow idea of blood diverted to vital organs in extreme cold*
- muscles may shiver to release (heat) energy

- from respiration, some of which is lost as heat

[6]

Q1.This question is about the nervous system.

(a) Describe the function of receptors in the skin.

.....
.....
.....
.....

(2)

(b) A response is caused when information in the nervous system reaches an effector.

(i) There are two different types of effector.

Complete the table to show:

- the two different types of effector
- the response each type of effector makes.

Type of effector	Response the effector makes
1
2

(4)

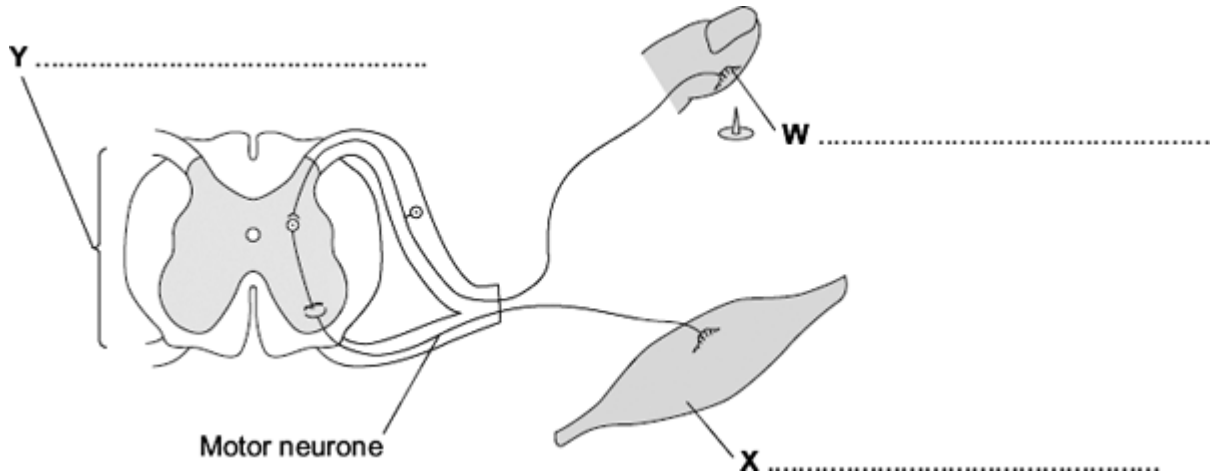
(ii) Some effectors help to control body temperature.

Give **one** reason why it is important to control body temperature.

.....

.....
(1)
(Total 7 marks)

Q2. The diagram shows the structures involved in a reflex action.



(a) On the diagram, name the structures labelled **W**, **X** and **Y**.

(3)

(b) The control of blood sugar level is an example of an action controlled by hormones.

Give **two** ways in which a reflex action is different from an action controlled by hormones.

1

.....

.....

2

.....

.....

(2)
(Total 5 marks)

Q3. Diabetes is a disease in which a person's blood glucose concentration may rise.

Doctors give people drugs to treat diabetes.

The table shows some of the side effects on the body of four drugs, **A**, **B**, **C** and **insulin**, used to treat diabetes.

Drug	Side effects on the body
A	Weight loss Liver, kidney and heart damage Feeling of sickness
B	Weight gain Damage to some cells in pancreas
C	More water is kept in the body Weight gain Increased chance of bone breakage in women
Insulin	A little more water is kept in the body Weight gain Increased risk of lung damage

(a) Which drug, **A**, **B**, **C** or **insulin**, is most likely to result in an increase in blood sugar concentration in some people?

Explain your answer.

Drug

Explanation

.....
.....

(2)

(b) (i) Drugs **A**, **B** and **C** can be taken as tablets.

The chemicals in the tablets are absorbed into the blood from the digestive system.

Insulin is a protein.

Insulin **cannot** be taken as a tablet.

Why?

.....

(1)

(ii) Other than using drugs, give **two** methods of treating diabetes.

1

2

(2)

(Total 5 marks)

Q4.The human body produces many hormones.

(a) (i) What is a *hormone*?

.....
.....

(1)

(ii) Name an organ that produces a hormone.

.....

(1)

(iii) How are hormones transported to their target organs?

.....

(1)

(b) Describe how the hormones FSH, oestrogen and LH are involved in the control of the menstrual cycle.

.....
.....
.....
.....
.....
.....
.....
.....
.....

(3)

(Total 6 marks)

Q5. A group of students is going on an outdoor expedition.
The students need to keep warm in windy conditions.

The table shows the effect of wind speed on how quickly someone gets frostbite at different air temperatures.

Wind speed in metres per second	Air temperature in °C				
	10	0	-10	-20	-30
0					
5					
10					
15					
20					

Key	
Time taken to get frostbite:	<input type="checkbox"/> No frostbite
	<input type="checkbox"/> 30 minutes
	<input type="checkbox"/> 10 minutes
	<input type="checkbox"/> 5 minutes

(a) (i) Describe the effect of changing air temperature on the time taken to get frostbite.

.....

(1)

(ii) What is the longest time it is safe to stay outside when the air temperature is -20 °C and the wind speed is 10 metres per second?

..... minutes

(1)

(b) When core body temperature begins to fall, changes may happen in the body.

Which **two** changes will happen when core body temperature begins to fall?

Tick (✓) **two** boxes.

More blood flows through skin capillaries

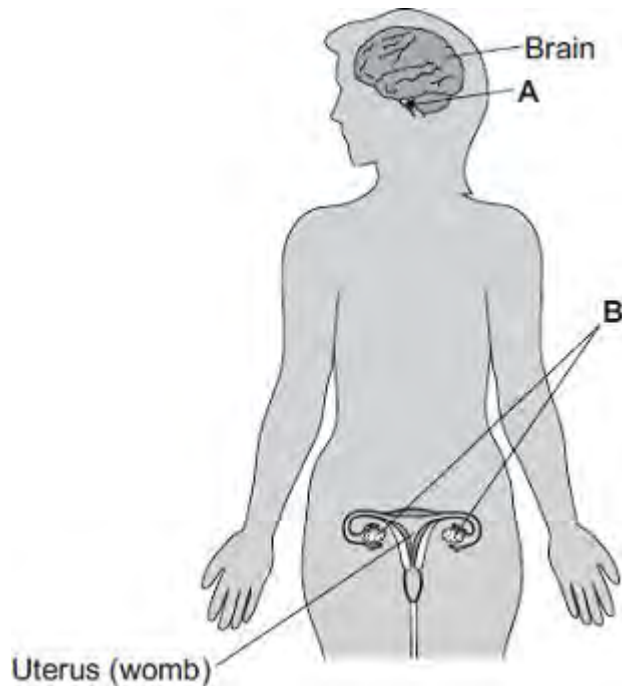
Muscles 'shiver'

Blood vessels supplying the skin capillaries constrict

Sweat glands release more sweat

(2)
(Total 4 marks)

Q6. The diagram shows the position of two glands, **A** and **B**, in a woman.



(a) (i) Name glands **A** and **B**.

A

B

(2)

(ii) Gland **A** produces the hormone Follicle Stimulating Hormone (FSH).

FSH controls changes in gland **B**.

How does FSH move from gland **A** to gland **B**?

.....

(1)

(b) (i) A woman is not able to become pregnant. The woman does not produce mature eggs. The woman decides to have In Vitro Fertilisation (IVF) treatment.

Which **two** hormones will help the woman produce and release mature eggs?

Tick (✓) **one** box.

FSH and Luteinising Hormone (LH)

FSH and oestrogen

Luteinising Hormone (LH) and oestrogen

(1)

- (ii) Giving these hormones to the woman helps her to produce several mature eggs.

Doctors collect the mature eggs from the woman in an operation.

Describe how the mature eggs are used in IVF treatment so that the woman may become pregnant.

.....

.....

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.....

(3)

- (iii) IVF clinics have been set a target to reduce multiple births.

At least 76% of IVF treatments should result in single babies and a maximum of 24% of treatments should result in multiple births.

Suggest **one** reason why the clinics have been set this target to reduce multiple births.

.....

.....

(1)

- (c) Two clinics, **R** and **S**, used IVF treatment on women in 2007. Doctors at each clinic used the results of the treatments to predict the success rate of treatments in 2008.

The table shows the information.

	Total number of IVF treatments in 2007	Number of IVF treatments resulting in pregnancy in 2007	Predicted percentage success rate in 2008
Clinic R	1004	200	18–23
Clinic S	98	20	3–56

- (i) Compare the success rates of the two clinics in 2007.

.....
.....

(1)

- (ii) The range of the predicted success rate in 2008 for clinic **R** is much smaller than the range of the predicted success rate for clinic **S**.

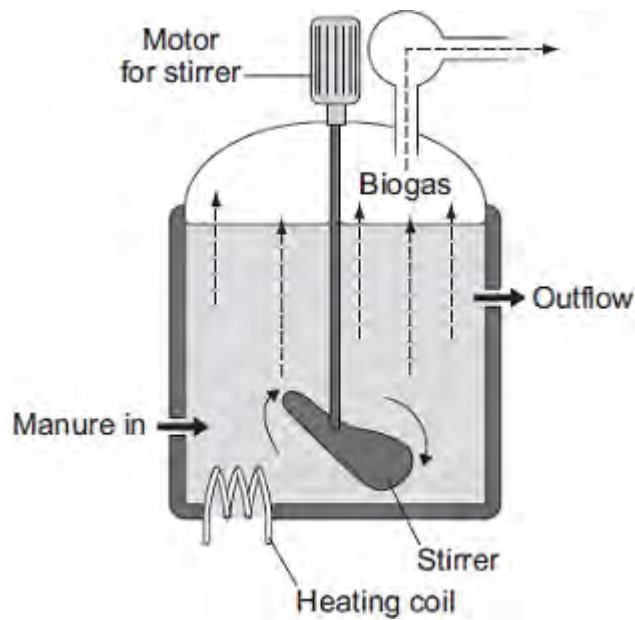
Suggest why.

.....
.....
.....
.....

(2)

(Total 11 marks)

Q7. The diagram shows one type of *anaerobic* digester. The digester is used to produce biogas.



(a) (i) What does *anaerobic* mean?

.....

(1)

(ii) The concentration of solids that are fed into this digester must be kept very low.

Suggest **one** reason why.

.....

(1)

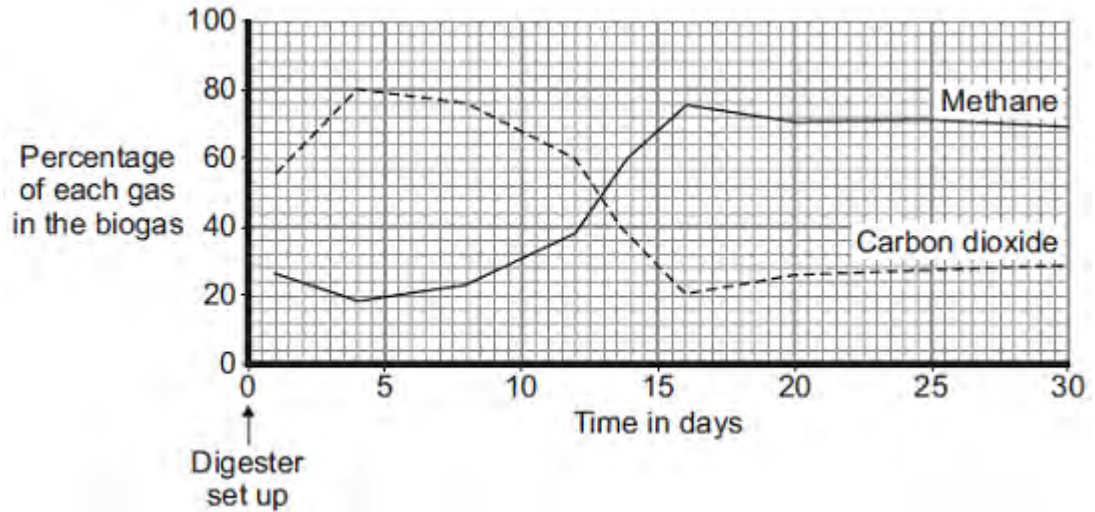
(iii) This digester is more expensive to run than some other simpler designs of biogas generator.

Suggest **one** reason why.

.....

(1)

- (b) The graph shows how the composition of the biogas produced by the digester changed over the first 30 days after the digester was set up.



Use information from the graph to answer the following questions.

- (i) Describe how the percentage of carbon dioxide changed over the 30 days.

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.....

(3)

- (ii) On which day was the best quality biogas produced?

(1)

- (c) Four days after the digester was first set up, the biogas contained a high percentage of carbon dioxide.

Suggest an explanation for this.

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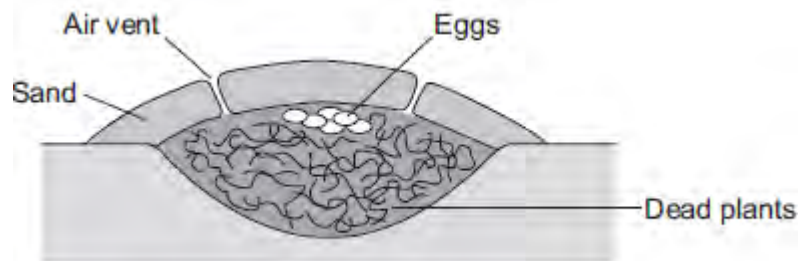
(2)
(Total 9 marks)

Q8. Most birds sit on their eggs to keep them warm until they hatch.

Megapode birds:

- dig a large hole in sand
- fill the hole with dead plants
- lay their eggs on top of the dead plants
- cover the surface with a thick layer of sand.

The image below shows a megapode bird's nest.



- (a) The dead plants in the nest decay. The decaying process helps to keep the eggs warm for many weeks.

Suggest how.

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.....

(3)

- (b) (i) Megapode birds open and close the air vents of the nest at different times of

the day.

Suggest reasons why it is necessary to open and close the air vents.

.....

.....

.....

.....

.....

.....

(3)

- (ii) The sex of a megapode bird that hatches from an egg depends on the temperature at which the egg was kept.

Use this information to suggest why it is important for megapode birds to control the temperature of their nests.

.....

.....

(1)

(Total 7 marks)

Q9. In this question you will be assessed on using good English, organising information clearly and using specialist terms where appropriate.

The human body is kept at a constant internal temperature of about 37 °C.

Body temperature is monitored and controlled by the thermoregulatory centre in the brain.

Describe what happens in the body to keep the body temperature constant.

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Extra space

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(Total 6 marks)

New (9-1) AQA GCSE Biology Paper 2: Homeostasis and Response Complete Revision Summary

This page contains the detailed and easy notes for AQA GCSE Biology Cell Biology for revision and understanding Cell Biology.

New (9-1) AQA GCSE Biology Paper 2: Complete Revision Summary

HOMEOSTASIS AND RESPONSE

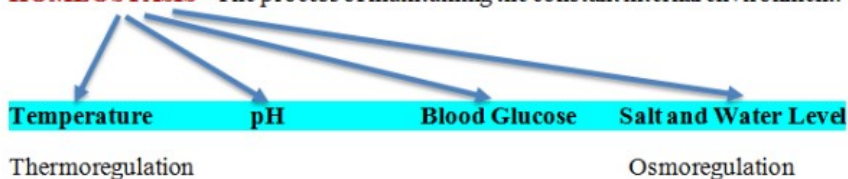
4.5 Homeostasis and Response

- Homeostasis
- Human Nervous System
- The Brain
- The Eye
- Thermoregulation
- Endocrine System
- Control of Blood Glucose
- Osmoregulation
- Human Reproduction
- Contraception
- Negative Feedback
- Plant Hormones



HOMEOSTASIS - The process of maintaining the constant internal environment

HOMEOSTASIS - The process of maintaining the constant internal environment.



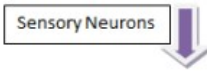
Nervous System and the Hormonal System

Homeostasis is important for the enzymes as the enzymes control all the reactions of the body and they need optimum condition to work.

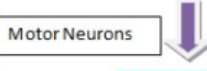
STIMULUS - Change in External or internal conditions that produces a response.



RECEPTORS - External receptors are the sense organs and internal receptors are in the brain



CENTRAL NERVOUS SYSTEM - It the brain and the spinal chord that process the information



EFFECTORS

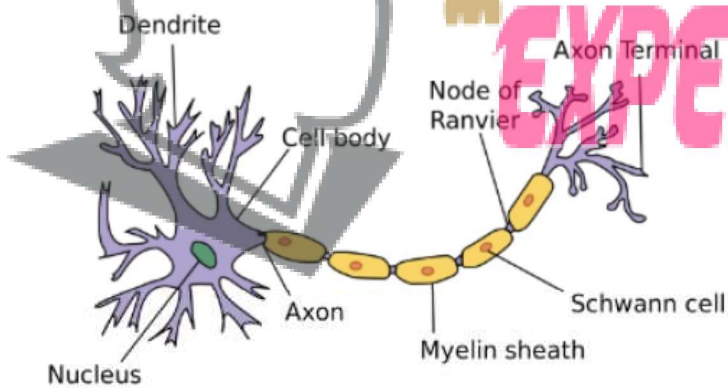


RESPONSE - Muscles or glands that take a response

NEURONES

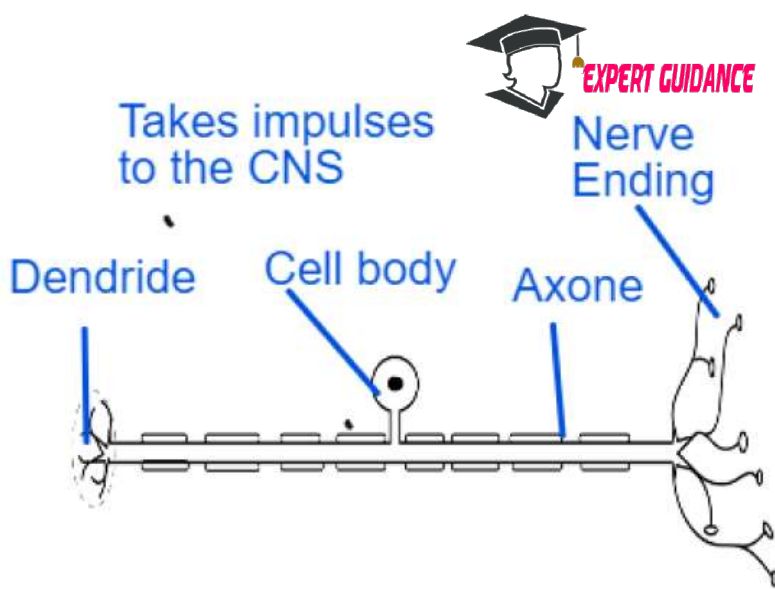
Motor Neurone

- Motor Neurones connect the CNS to the Effectors
- Takes impulses away from CNS
- Motor neurones sends the message from the central nervous system to the effectors.



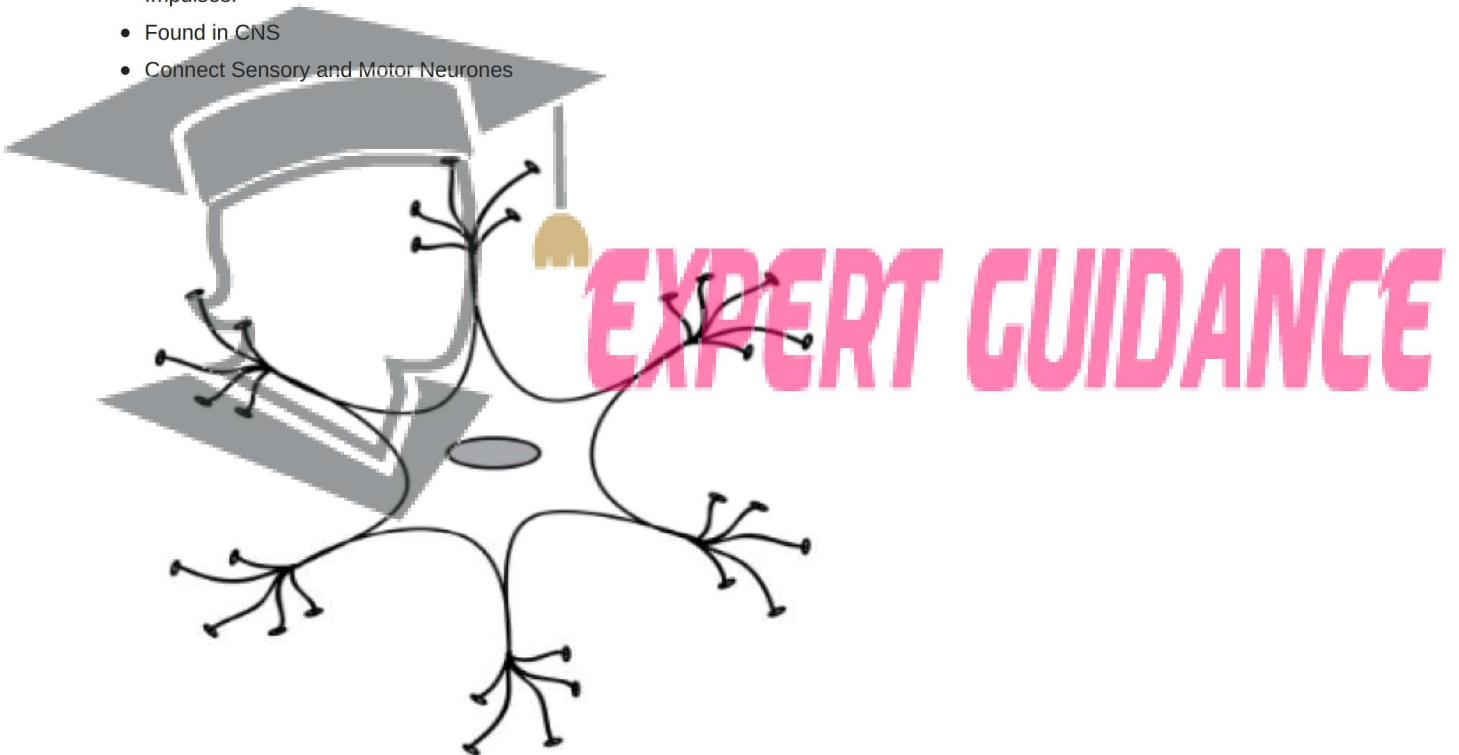
Sensory Neurone

- Sensory Neurones connect sense organs with the Central Nervous System.



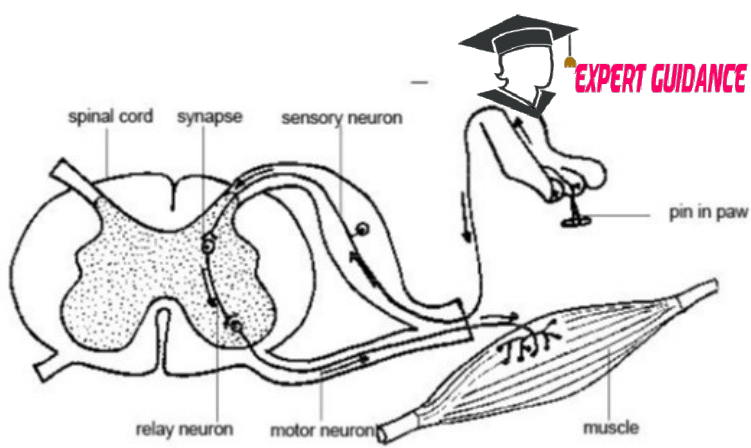
Relay Neurone

- Relay Neurones are present in the CNS and occur between the sensory and motor neurons for distant transmission of Impulses.
- Found in CNS
- Connect Sensory and Motor Neurones



REFLEX ACTIONS

- It is the automatic response of the body to a stimulus.
- In reflex action the message from the sensory neurones is passed to the spinal chord instead of brain.
- Spinal Chord sends the message to the effectors and produce a response



EXPERT GUIDANCE

Example: Knee Jerk Reflexes,

- Touching hot object, Sudden closure of light with bright light
- It is rapid
- It is quick Automatic, Instantaneous without conscious thoughts

Stimulus

Sensory neurones

Receptor

Sensory neurones

Spinal Chord

Motor neurones

Effector

Response

EXPERT GUIDANCE

SYNAPSE

Message is transmitted by chemicals



Source: pixabay

BRAIN – It is the Central information processing organ of our body, and acts as the command and Control System.

CEREBRUM (Cerebral Hemisphere) – It is nearly 80% part of the brain

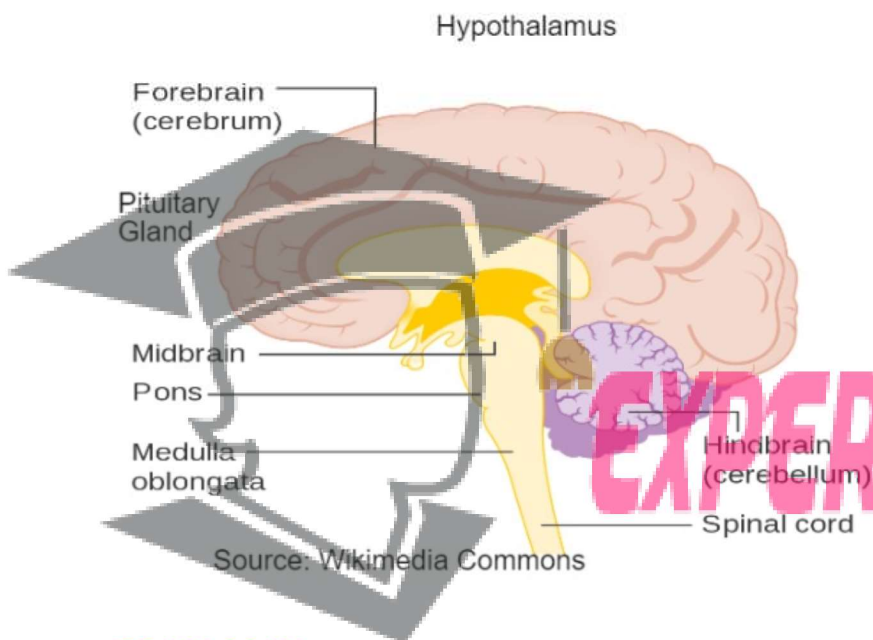
- Consciousness
- Memory
- Intelligence
- Language

CEREBELLUM – It lies behind the cerebrum and above the medulla oblongata. It is the second largest part of brain and is highly convoluted area which accommodates many neurons.

- Muscle Coordination
- Balance

MEDULLA OBLONGATA or oblong marrow is oblong cylindrical part of the brain. It forms the hindermost part of the brain.

- Unconscious Activities like Heart Rate, Breathing.
- Gut Movement



BRAIN SCAN

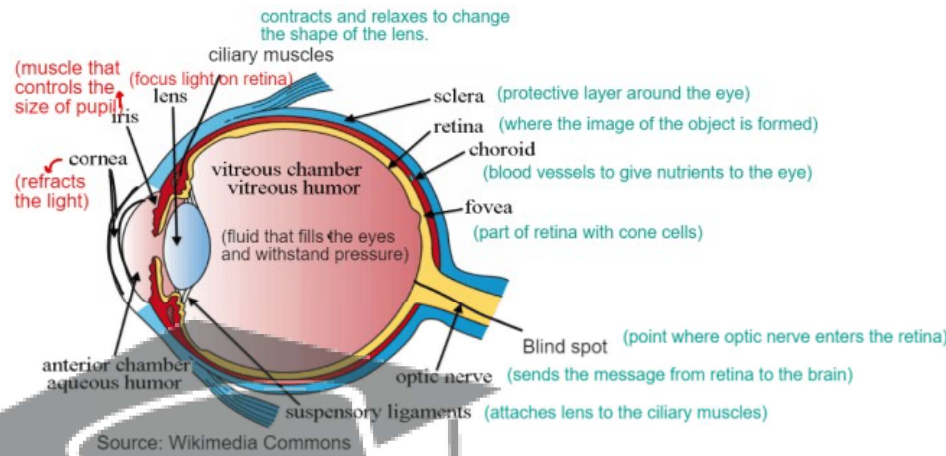
Magnetic Resonance Imaging (MRI) helps to take the Images of different parts of the brain and relating it with loss of functions of the individual



Problems

- Brain is complex
- Skull protects the brain
- Thousands and neurones and neurotransmitter are involved
- The functions of different parts is still not understood.
- Drugs do not reach the brain

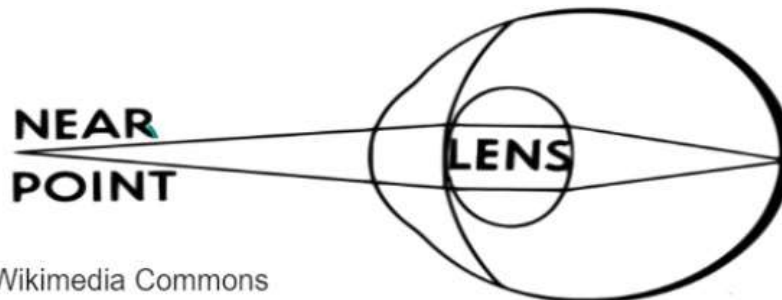
Eye – It is lodged in orbit of skull, hollow, spherical organ, about 2.5 cm in diameter and about 6-8gram in weight



ACCOMMODATION- Ability of eye to adjust the focal length of the lens to make clear image of the objects lying at varying distances. It is a reflex mechanism and is done with the help of ciliary muscles and suspensory ligament.



For distant vision, ciliary muscle relax making the suspensory ligaments tensed which inturn make the lens thin so that the image is focussed on the retina.



Source: Wikimedia Commons

For near vision, ciliary muscle contract making the suspensory ligaments to slack which inturn make the lens thick so that the

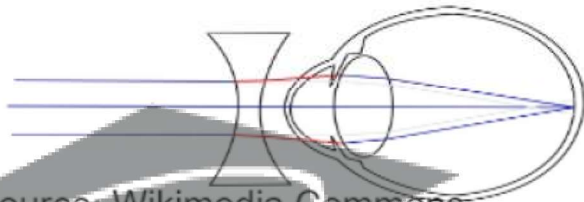
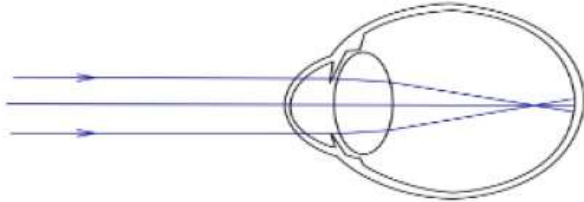
image is focussed on the retina.



DEFECTS OF VISION

MYOPIA

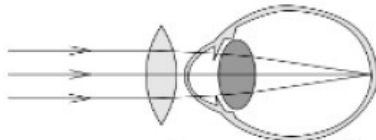
- Short sightedness
- The image falls in front of the retina of the eye.
- Eye ball gets elongated
- corrected by concave lens



Source: Wikimedia Commons

HYPERMETROPIA

- Long sightedness
- The image falls behind the retina of the eye.
- Eye balls gets shortened
- corrected by convex lens



Source: Wikimedia Commons

NEW EYE TECHNOLOGIES

Contact Lenses

- Lenses are placed on the surface of the eye.
- Includes soft, silk and disposable lenses
- Can be used by any person at any age

Laser Surgery

EXPERT GUIDANCE

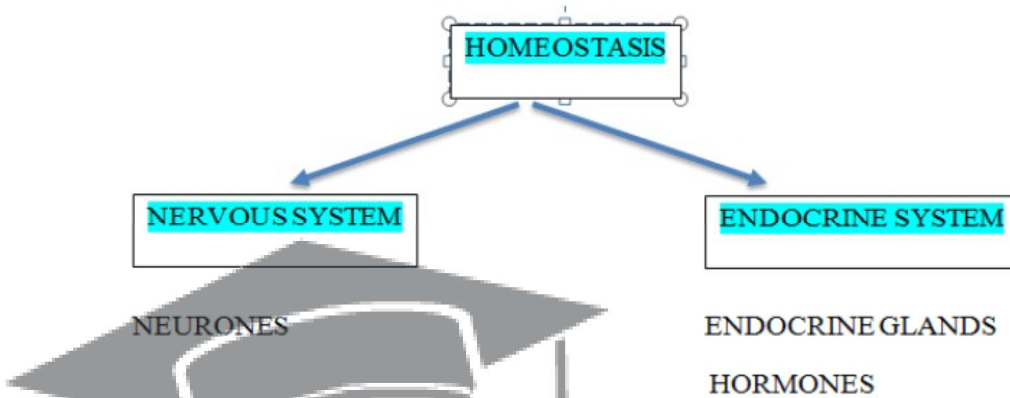


- Laser is used to change the thickness or the curve of the cornea so that defects of vision can be corrected.
- Can be done on adults after the growing age.

Replacement Lens

- It involves either replacing the faulty lens or inserting the correct one with the faulty one.
- Include damage risk to the eye.

HORMONAL CONTROL



HORMONAL and NERVOUS SYSTEM

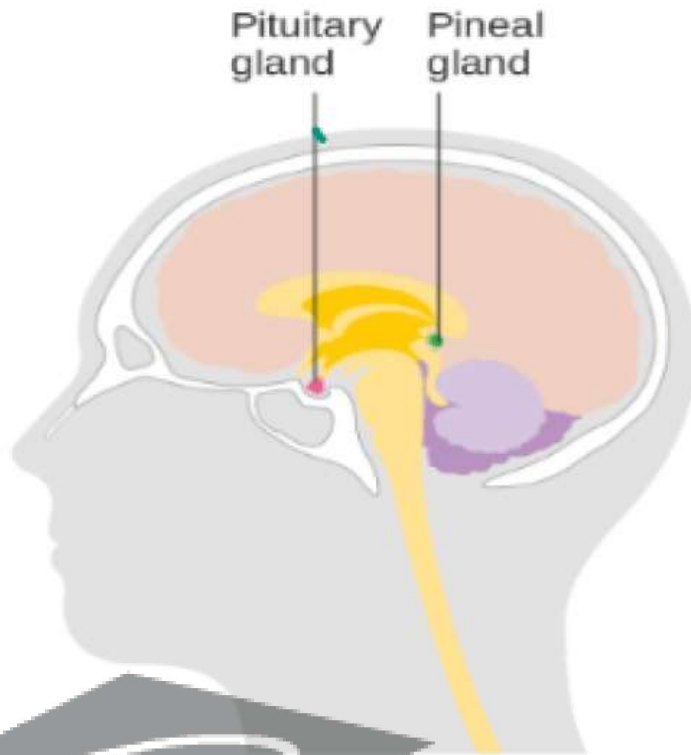
Hormones

- They are chemical messenger secreted by the endocrine glands
- they are secreted in the blood and travel to the target organ
- Target organ has receptors and hormones
- bind to the receptor and triggers a response
- It produces a slower but long term response

Nervous System

- Is the system of neurones which send electrical impulses to produce a response
- The message is transmitted via electrical impulses
- The response produced is localised and impulses do not travel large distances
- It produces quick but short term response

PITUITARY : THE MASTER GLAND – Smallest endocrine gland of the body. It is pea shaped, ovoid, reddish brown gland situated at base of the brain in cavity, sella turcica of sphenoid bone. It controls almost all endocrine glands. Hence it is also called master gland



Source: Wikimedia

- Master Gland
- It controls other glands of the body
- Follicle Stimulating Hormone
- Antidiuretic Hormone
- Thyroid Stimulating Hormones

EXPERT GUIDANCE

EXAMPLES

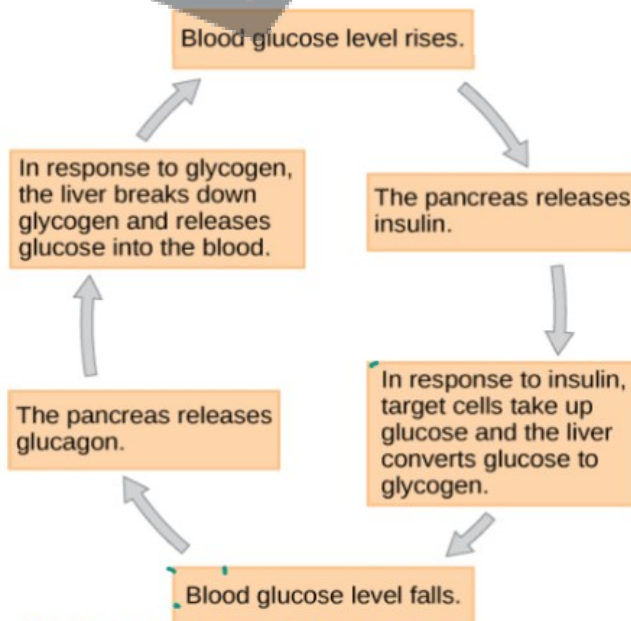
GLAND	HORMONE	TARGET ORGAN	EFFECT
Pituitary	Follicle stimulating hormone (FSH)	Ovaries	make the female sex hormones estrogen
	Thyroid stimulating hormone (TSH)	Thyroid Gland	stimulate the gland to release thyroxine which control metabolism
	Anti-diuretic hormone (ADH)		controls the water level by causing reabsorption of water

Thyroid Gland	Thyroxine	Liver and Kidneys	Controls the metabolism
Adrenal Gland	Adrenaline	Liver and Heart	prepares for fight and flight
Testes	Testosterone	Male reproductive organs	Developes secondary sexual characteristics
Pancreas-	Insulin	Liver	Decreases blood glucose levels
	Glucagon	Liver	Increases blood glucose levels
Ovaries	Oestrogen Progesterones	Female reproductive organs	Controls the development of egg, menstrual cycle and develop secondary sexual characteristics.

CONTROL OF BLOOD GLUCOSE

- Pancreas insulin and Glucagon (lowers the blood glucose level)
- Increases the blood glucose level)
- Insulin Effect
- It increases the permeability of cells to glucose
- It converts excess glucose to -glycogen
- It converts excess glucose to fats
- It stops the breakdown of fats

EXPERT GUIDANCE



Source: Wikimedia Commons

Glucagon is the hormone

Glycogen is the stored carbohydrate



DIABETES

TYPE 1	TYPE 2
Insulin dependent	Insuline independent
Body does not produce insulin	Body is resistance to insulin
Caused by damage to pancreas	Caused by poor lifestyle and diet
Treated with insulin injections	Treated with lifestyle changes
Most common in young age	Common in obese people
It can be genetic.	It is mostly environmental.
Drugs might not be required	Drugs are given to make body to respond to insulin

DIABETES TREATMENT

TYPE 1

- Insulin injections directly into the blood stream.
- Less taken orally as being a protein hormone it can get digested by stomach.
- The insulin converts excess glucose into glycogen and control the blood glucose level.
- Less intake of carbohydrates.
- Pancreatic Transplant
- Pancreatic Cell Transplant
- Using stem cells to regenerate pancreatic cells.

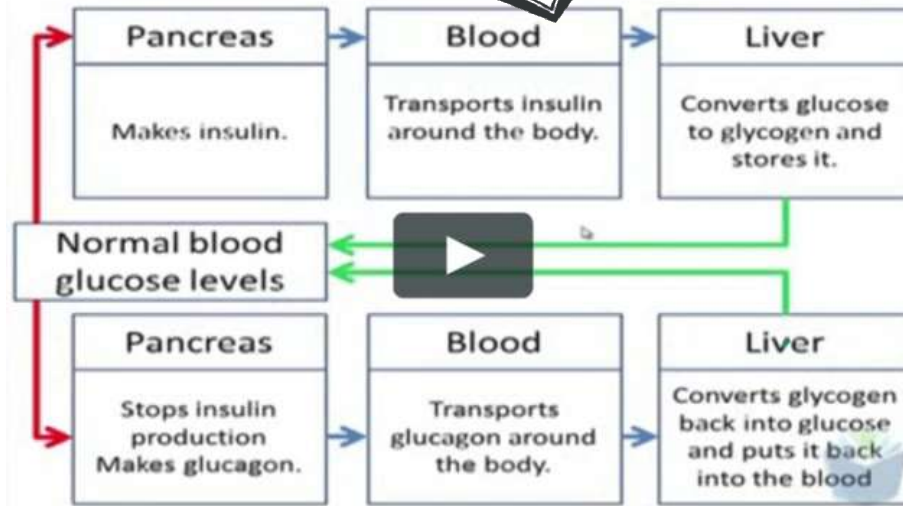
TYPE 2

- Balanced diet
- Regular Exercise
- Weight Management
- Drug to increase sensitivity of pancreas to insulin
- Insulin injections to increase the concentration of insulin to make them more responsive to insulin.

NEGATIVE FEEDBACK

- When the level of anything rises above optimum like glucose concentration, water concentration or temperature negative feedback decreases it
- When the level of anything decreases below optimum the negative feedback raises it.





FIGHT OR FLIGHT HORMONE

- Stress Hormone
- Increase heart rate
- Increase breathing rate
- Dilate the pupil



Emergency Hormones

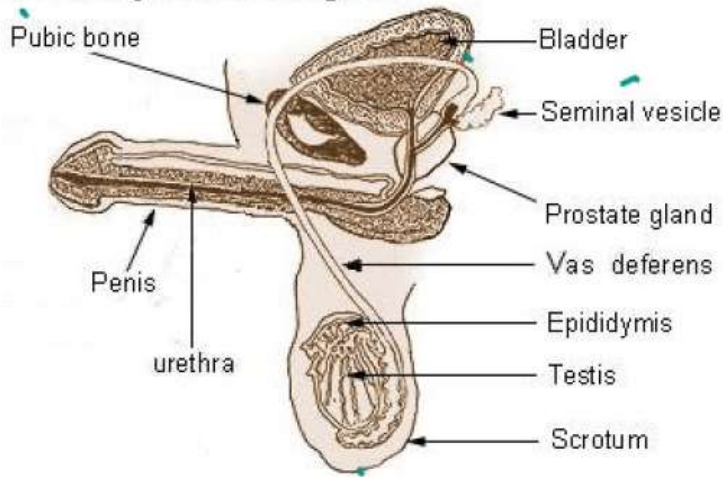
- Increase Blood Flow
- Increase the flow of oxygen to the brain
- Divert blood flow away from the gut

HUMAN REPRODUCTIVE SYSTEM

TESTOSTERONE

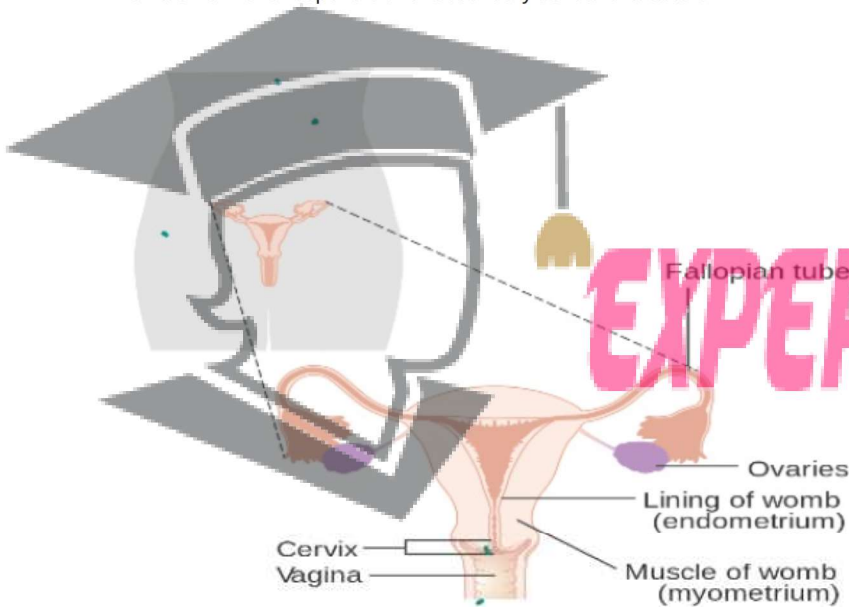
Male hormone responsible for secondary sexual characters

Male Reproductive System



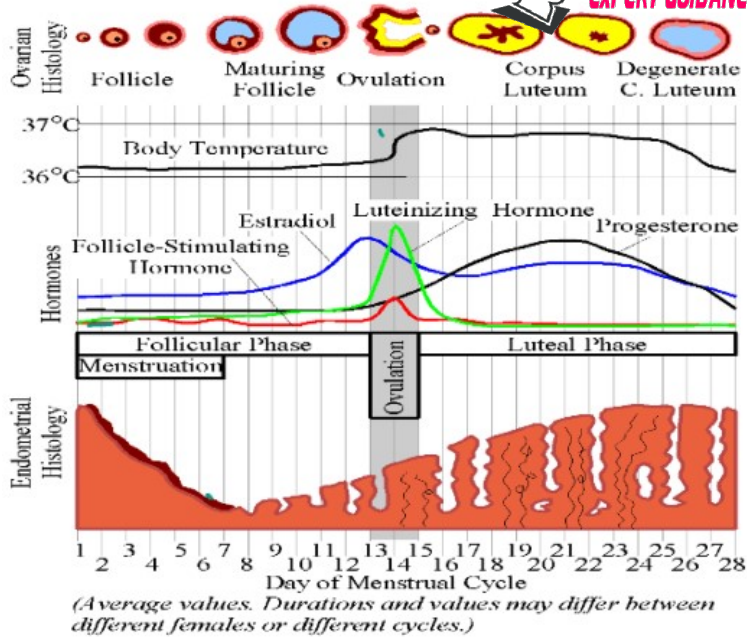
OESTROGEN

Female hormone responsible for secondary sexual characters



EXPERT GUIDANCE

MENSTRUATION CYCLE

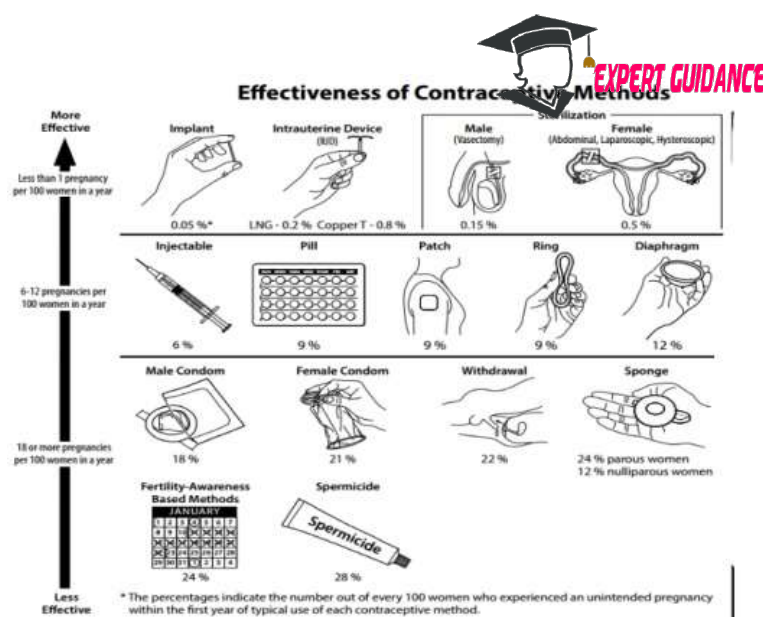


Days	Phase	Development
Day 1- Day 4	Menstruation	Shedding of the uterus lining along with the egg. Progesterone falls
Day 5- Day 14	Follicular Phase	Egg is matured in the ovary. Increase in FSH
Day 14	Ovulation	Egg is released. Caused by Lutenizing Hormone
Day 14-Day 28	Luteal Phase	Increase in progesterone and oestrogen which maintains the uterus lining and wait for eggs to fertilize. If not fertilize in next 14 days lining breaks.

HORMONES OF MENSTRUATION

Hormone	Gland	Effective Days	Effect
Follicle Stimulating Hormone (FSH)	Pituitary	Day 1-Day 14	Maturation of egg in the follicle. Stimulate the production of Oestrogen
Lutenizing Hormone (LH)	Pituitary	Day 14	Cause Ovulation
Oestrogen	Ovaries	Day 14-Day 28	Develops uterus lining. Stimulates LH and inhibit FSH
Progesterone	Empty egg follicle in the ovaries	Day 14- Day 28	Maintains lining of uterus and prepare for pregnancy. Inhibits both LH and FSH So no menstration happen during pregnancy.

CONTRACEPTION METHODS



Preventing Sperms to reach the egg. Preventing the implantation of the zygote in the uterus.

Barrier Methods: Prevent the sperm to meet the eggs

Hormonal Methods: Prevents the eggs to mature or prevent the implantation of eggs in the uterus.

Chemical Methods: Kills the sperm

Intrauterine Device: Prevent embryo from implanting

Surgical Method: It is permanent contraception

HOW CONTRACEPTION WORKS?

Contraceptive Pills

- They contain the mix of female hormones oestrogen and progesterone. -MIX PILL
- Prevent the release of FSH preventing the maturation of eggs
- Make thick mucus in the cervix to prevent the entry of sperms.
- Prevent the uterus lining development, preventing implantation.
- Some pills are progesterone only pills.
- A contraceptive implant is also inserted which slowly release progesterone in the uterus.
- A contraceptive patch also absorbs the mix of hormones into the blood
- Side Effects: blood pressure, has to be taken daily changes in menstrual pattern

Contraceptive Pills

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Intra Uterine Device

- Copper T is inserted into the uterus
- It releases copper ions which are toxic to sperms
- The device also prevent the implanting of the embryo into the uterus
- Some releases progesterones which works the same like contraceptive pills
- Prevent the release of FSH preventing the maturation of eggs
- Make thick mucus in the cervix to prevent the entry of sperms.
- Prevent the uterus lining development, preventing implantation
- Side Effects: Infection; Internal Bleeding

Surgical Methods

VASECTOMY: Male Sterilization

- Sperms ducts are cut and sealed so that the sperms cannot enter the urethra preventing fertilization.

TUBECTOMY: Femal Sterilization

- The oviducts are cut and tied to prevent the release of egg which prevent
- Sterilization
- Side Effects - It is permanent.

INFERTILITY PROBLEMS

OVULATION PROBLEM

- The eggs do not mature or problem ovulating.
- The women is given fertility drugs which are the mix of FSH and LH that stimulated maturation and ovulation

FAULTY TUBES

IMPLANTATION

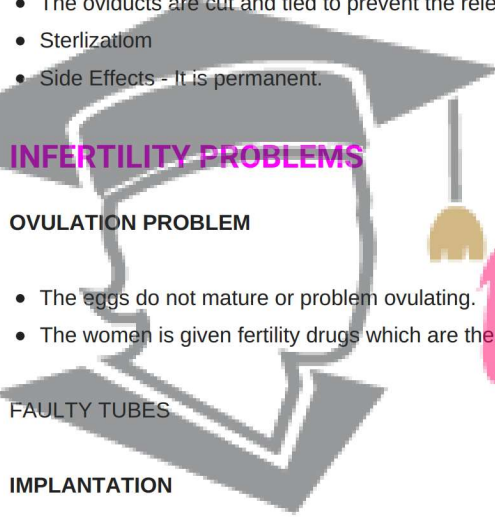
- In Vitro Fertilization where fertilization is performed in the laboratory and the embryo is implanted back in the uterus for the development

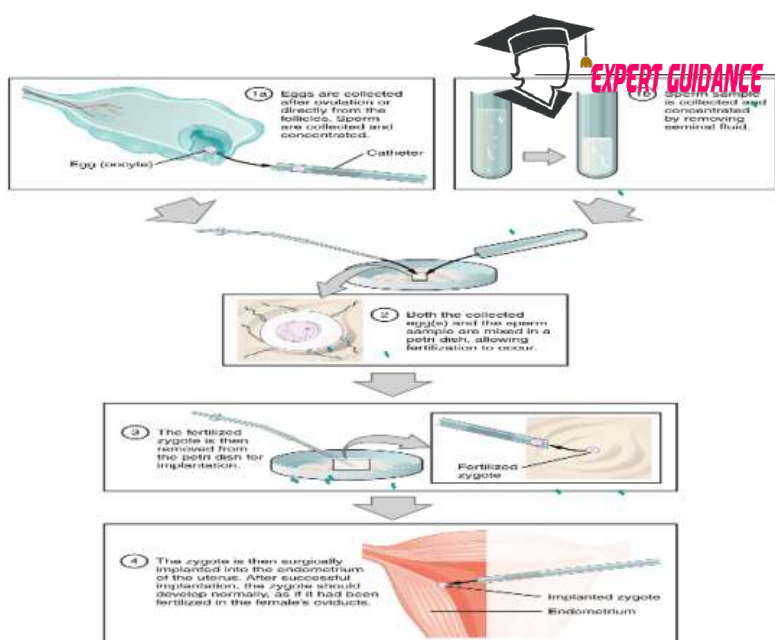
PREGNANCY DEVELOPMENT

- Surrogate Mother where the fertilized egg is implanted into another mother who gives birth

IN VITRO FERTILIZATION

- Expensive
- Results in multiple embryos
- Premature births
- Birth with disability
- Not always successful





Fertility drugs to stimulate ovulation

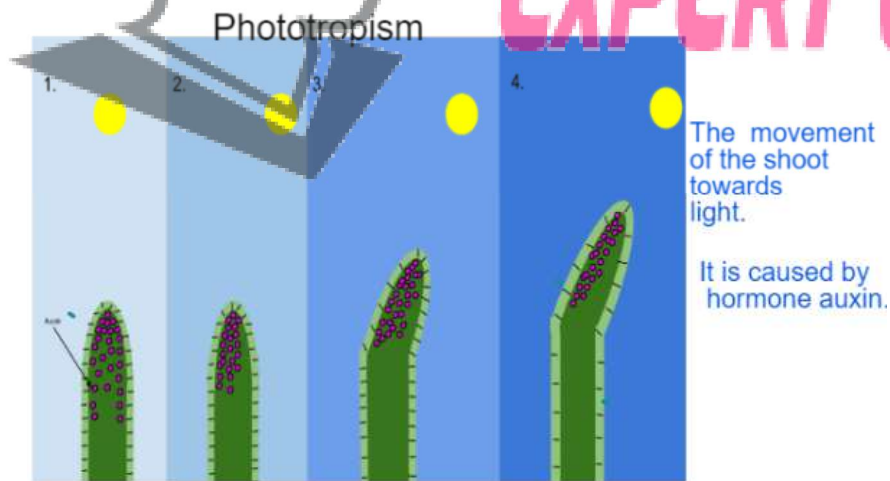
Ovary and sperm are collected to perform fertilization.

Fertilized egg is developed in the laboratory giving suitable conditions to develop into an embryo.

Embryo is inserted into the uterus

Develops into a baby.

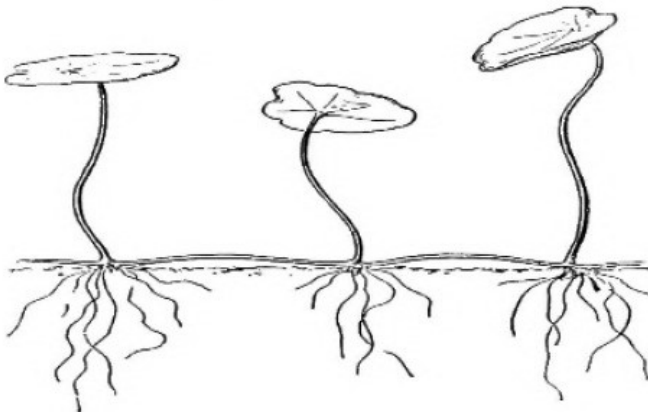
Plant Hormones



Auxin is produced in the shoot tip. When light falls on auxin it is displaced to the shade side promoting growth of the shade region resulting in growth of shoot towards light.

Gravitropism - The movement of roots towards gravity.

Gravitropism



- It is also caused by auxin. In roots auxin inhibits the growth of the roots at the lower side resulting in bending of the root downwards.
- Auxin is displaced to lower side in response to gravity.

PLANT HORMONES

AUXINS

- It stimulates cell division and growth of the plant
- It is used to stimulate rooting in tissue culture.
- Used as Weedicide causing excess growth of the weed and killing them.

GIBBERLINS

- Seed germination
- Promote flowering
- End seed dormancy
- Elongation of stem.

ETHENE

- It is a gaseous hormone
- It is involved in fruit ripening
- Allows transportation of raw fruit to long distances and then they can be ripened by ethene.

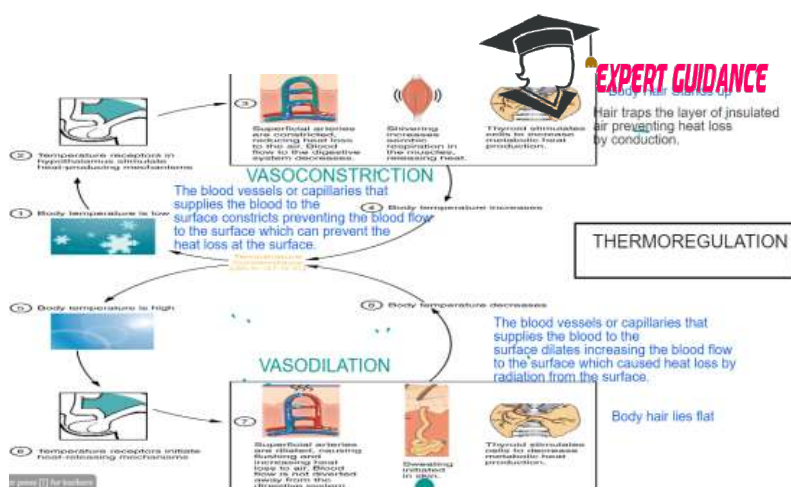
Cytokinin

Caused Cell Division

Abscisic acid

Stress hormone prepared the plant for stress conditions

EXPERT GUIDANCE



WASTE PRODUCTS

The products produced during metabolic reactions like respiration, digestion etc.

Carbon Dioxide

- Produced during respiration.
- Is excreted out through the lungs by the process of expiration
- Carbon dioxide is harmful as it can alter the pH of the blood affecting enzyme activity.

Water

- Produced during respiration and digestion process.
- Is excreted through skin in the forms of sweating or some by breathing and by kidney in the form of urine.
- Water can also disturb the osmotic balance and salt level of the body.

Urea

- Produced by the liver by metabolising excess proteins as it is toxic and cannot be stored.
- It is excreted by Kidney in the form of Urine.



HUMAN EXCRETORY SYSTEM

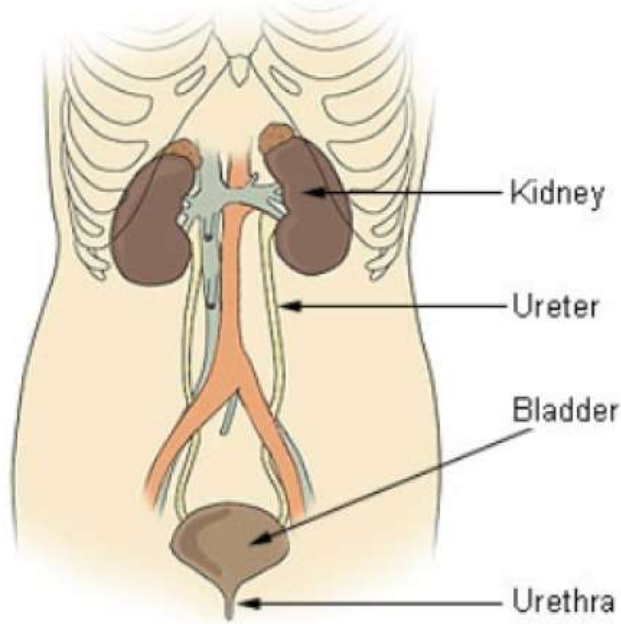
ULTRAFILTRATION

- Kidneys filters the blood at a very high pressure.
- All the water, glucose, and useful components gets into the kidney filtrate. The blood cells and blood proteins due to their bigger Size are not filtered.

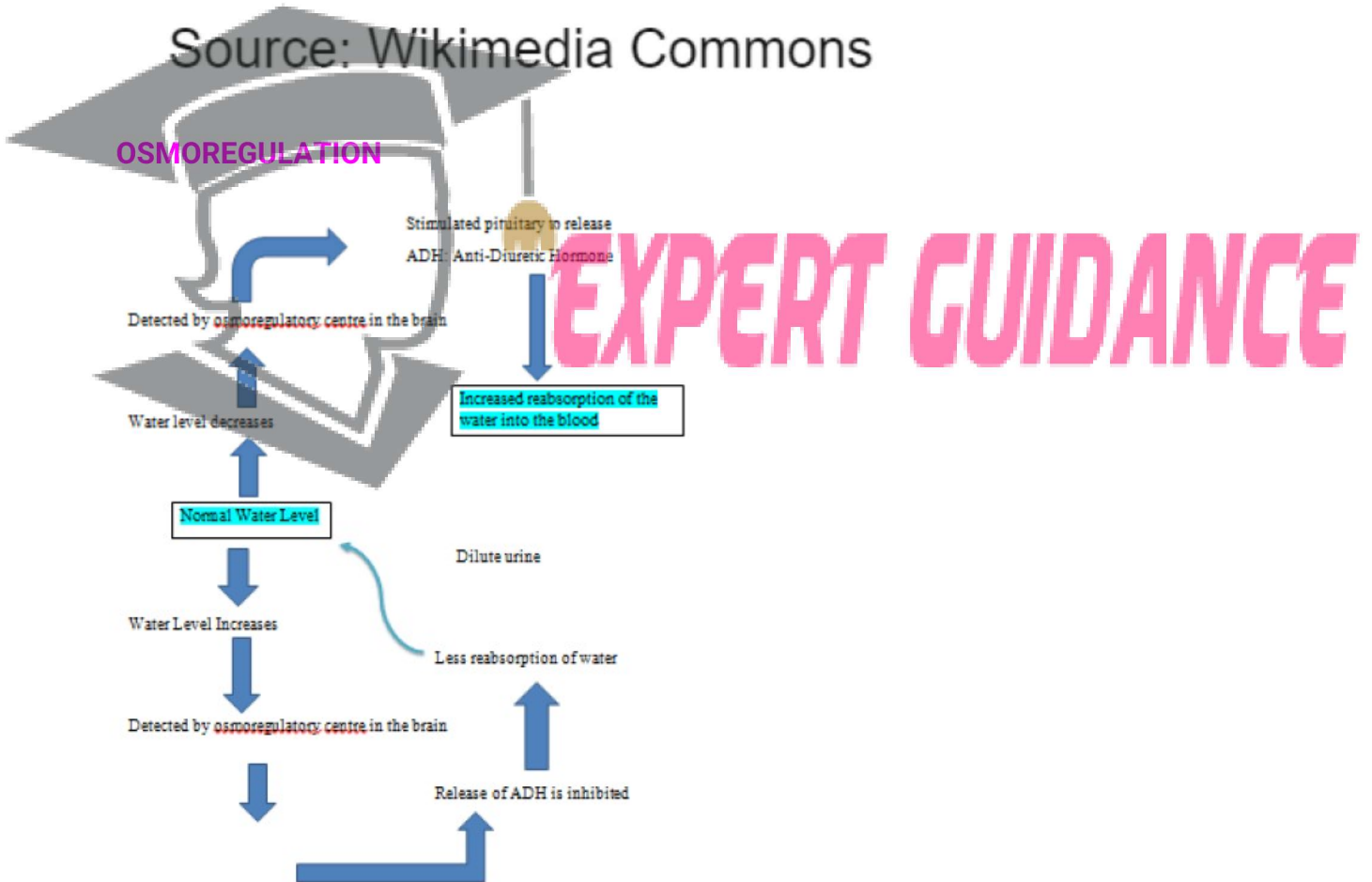
SELECTIVE REABSORPTION

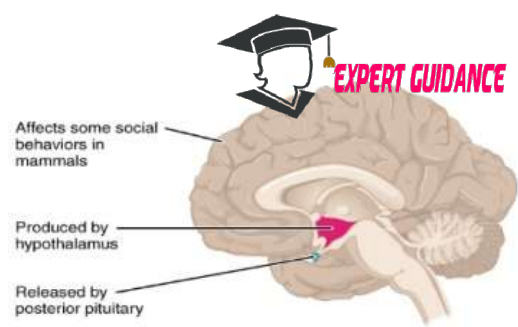
- Since the kidney contains useful substance in the filtrate it reabsorbs back them into the blood.
- The water also gets reabsorbed depending on the needs of the body.

Components of the Urinary System

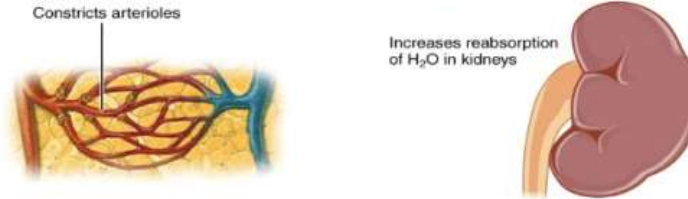


Source: Wikimedia Commons



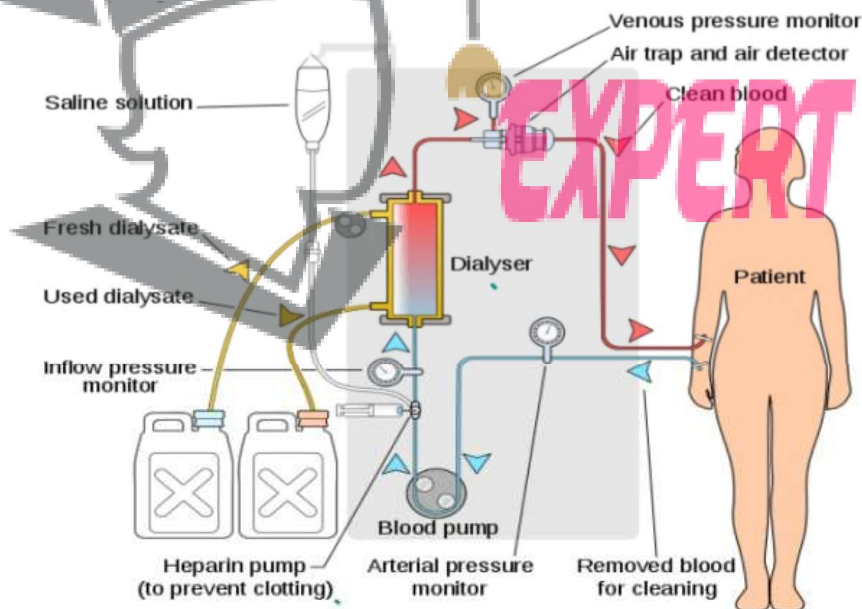


NEGATIVE FEEDBACK



DIALYSIS

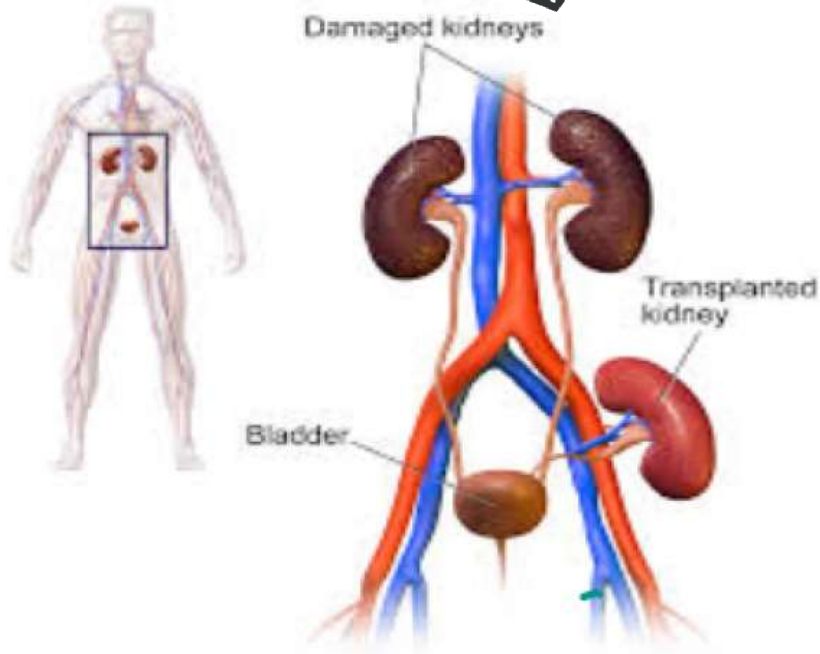
- Artificial Kidney blood flows into the dialysis machine which contains dialysis fluid.
- Dialysis fluid contains the same concentration of essential minerals ions, as that of blood but no urea.
- As blood flows into the dialysis fluid, urea is diffused out along the concentration gradient and excess salt is also removed maintaining the normal salt and mineral ions level.
- The clean blood is then pumped back.
- Lifestyle changes, regular visits, change in diet and regular expenditure are some of the disadvantages.



EXPERT GUIDANCE

KIDNEY TRANSPLANT

- Replacing diseased kidney with the healthy one.
- The donor should be a close relative to prevent rejection.
- The person has to be on Immuno - suppressant drugs so that the body immune system does not reject it.
- Does not last long and person is prone to other infectious diseases due to immuno suppressant drugs.



Kidney Transplant

Source: [Wikimedia Commons](#)

DIALYSIS KIDNEY TRANSPLANT

DIALYSIS

Advantages

- No surgery
- No infection
- No immuno supressant drugs
- Easyily available

Disadvantages

- Lifestyle changes
- Regular visits and long procedure
- Restricted Diet

KIDNEY TRANSPLANT

Advantages

- No regular visit
- No lifestyle changes
- No diet restriction

Disadvantages

- Does not last forever

- Chances of rejection
- Immuno suppressant drugs to be taken
- Person is more prone to infections.
- Finding a suitable donor is a problem

KEY TERMS

- **Homeostasis** - Homeostasis is the process of an organism to maintain a stable internal environment adequate to sustain life.
- **Receptors** – Receptor is any cell or organ of an animal capable of detecting a stimulus is a change in the external or internal environment and which subsequently brings about a response in the behavior of the animal.
- **Effectors** – Effector is any muscle, gland or an organ capable of responding to a stimulus, particularly a nervous impulse.
- **Stimulus** - A biological stimulus is any external change in the environment that can be detected by an organism.
- **Neurons** – These are structural and functional Units of Neural System. Each Neuron consists of the cell body (cyton) and nerve fibre (axon)
- **Central Nervous System** – Consists of Brain and Spinal cord
- **Sensory Neurons** – These connect sense organs with the Central Nervous System.
- **Motor Neurons** – These connect the CNS to the Effectors
- **Relay Neurons** – These are present in the CNS and occur between the sensory and motor neurons for distant transmission of Impulses.
- **Reflex Arc** - The path followed by the stimulus (impulse) from beginning to end is the reflected arc.
- **Brain** – It is the Central information processing organ of our body, and acts as the command and Control System.
- **Cerebral Cortex** – Grey matter forms 2-4mm thick outer cortex of cerebrum called cerebral cortex
- **Cerebellum** – literally means little cerebrum. Cerebellum has grey matter on outer side and made of three layers of cells and fibres. 2nd largest part of the brain.
- **Medulla** - directly controls some ANS responses, such as heart rate, respiration, dilation of blood vessels, digestion, sneezing, swallowing and vomiting. It is a part of the brain stem, located just below the prominence and just above the spinal cord.
- **Magnetic Resonance Imaging (MRI)** - It helps to take the Images of different parts of the brain and relating it with loss of functions of the individual
- **Eye** – Hollow spherical organ, about 2.5cm in diameter and about 6-8gm in weight. It is lodged in orbit of skull.
- **Blind Spot** – The spot on the retina which has no receptor.
- **Accommodation**- Ability of eye to adjust the focal length of the lens to make clear image of the objects lying at varying distances. It is a reflex mechanism and is done with the help of ciliary muscles and suspensory ligament.
- **Ciliary Muscles** – help in accommodation and ciliary process that secretes aqueous humour.
- **Iris** – Visible coloured portion of the eye, contains two types of muscles- circular and radial.
- **Pupil** – In front of the lens the aperture surrounded by the iris is called the pupil.
- **Myopia** – Also known as near sightness or short sightness. Near object is Clear. Far object is not clear. Eyeball become longer.
- **Hypermetropia** – long sightness. Far object is clear, near object is not Clear. Eyeball becomes short.
- **Endocrine System** – the endocrine system consists of glands widely separated from each other with no direct anatomical links. Also called ductless glands
- **Hormones** – Hormones are the chemical substances produced in the body that controls and regulates the activity of some cells or organs.
- **Adrenaline** – It is a hormone released by the adrenal glands and its main action, along with norepinephrine, is to prepare the body to "fight or flee".
- **Insulin** – Secreted by Pancreas, is a small protein whose molecule consists of two polypeptide chains
- **Pituitary Gland** – Smallest endocrine gland of the body. It is Pea shaped, ovoid, reddish brown gland situated at base of the brain. It controls almost all endocrine glands. Hence it is also called master gland.
- **FSH** – Follicle Stimulating Hormone. In males stimulates spermatogenesis. In females growth of ovarian follicles upto ovulation.
- **Oestrogen** – stimulation of growth and activities of female secondary sex organs, development of growing ovarian follicles, mammary gland development.



- **Progesterone** – it acts on the mammary glands and stimulates the formation of alveoli, milk secretion and supports pregnancy.
- **Glucagon** - Glucagon is produced to maintain blood glucose levels during fasting and to increase very low glucose levels.
- **Glycogen** - Glycogen is the major carbohydrate storage form in animals, and corresponds to starch in plants.
- **Diabetes** - Diabetes is a disease in which your blood glucose, or blood sugar, levels are too high.
- **Menstruation** - Menstruation or your period is the shedding of the uterine lining once a month.
- **Ovulation** - the release of an egg from an ovary — occurs about midway through the menstrual cycle.
- **Phototropism** – It is the ability of a plant, or other photosynthesizing organism, to grow directionally in response to a light source.
- **Gravitropism** - Gravitropism is a plant's natural growth response to the effects of gravity.
- **Auxins** - Auxin is involved in cell growth and cell expansion
- **Gibberlins** - Gibberellins promote stem elongation between nodes on the stem.
- **Dialysis** - The process of removing waste products and excess fluid from the body.
- **Selective Reabsorption** - Selective reabsorption is the process by which some molecules (eg - Ions, glucose and amino acids), after having been filtered by capillaries together with nitrogen waste products (eg Urea) and water in the glomerulus, are reabsorbed by filtration as they pass through the nephron.



EXPERT GUIDANCE