12.1	What is the role of the human nervous system?	The nervous system detects stimuli from the internal or external environment and uses electrical impulses to bring about the fast, but short-lived, responses.
12.2	Describe 2 ways of measuring reaction time.	Dropping a ruler and catching it, computerised tests involving pressing a button in response to seeing something on the screen – time recorded by the computer
12.3	Summarise the order in which the nervous system works?	Stimuli, receptor, sensory neurone, CNS, motor neurone, effector, response
12.4	Name 3 types of neuron.	Sensory, Motor and Relay
12.5	What is a <b>synapse</b> and how does it work?	<ul> <li>The methods by which the nervous impulse crosses the gap between neurones.</li> <li>1. Impulse arrives at the end of neurone A</li> <li>2. Neurotransmitter is released into the synaptic gap</li> <li>3. Neurotransmitter diffuses across the synaptic gap</li> <li>4. Neurotransmitter binds to the receptors on neurone B</li> <li>5. A new electrical impulse is generated in neurone B</li> </ul>
12.6	What neurone is involved in a reflex?	Relay
12.7	Why are reflexes important?	Reaction remove your body from danger.
12.8	Why are reflexes faster?	The do <b>not involve the conscious part of the</b> <b>brain,</b> therefore no conscious thought
12.9	What is a receptor? State 3 examples.	<b>Cells that detect stimuli</b> (changes in the internal or external environment). Eyes, ears, skin, thermoreceptors, pressure receptors, tongue, nose
12.10	What is a stimulus?	A change in the environment(internal/external)
12.11	What carries out a <b>respons</b> e? Give 3 examples.	Effectors – Muscle, gland or Organ
12.12	How is a nerve cell adapted?	<ul> <li>The cell body contains cytoplasm and nucleus (the control centre of the cell)</li> <li>The axon is a long extension of the cytoplasm (can be up to 1m). this means nerve impulses can be transmitted to the extremities by 1 cell.</li> <li>The myelin sheath is a fatty layer that surrounds to axon. The sheath act as an insulator and spreads up nerve impulses.</li> <li>The branched ends of the axon and the smaller branches coming from the cell body allow the neurone to make connections with other neurones.</li> </ul>

## Section 13 – Endocrine System

13.1	What is the endocrine system made of?	Glands which secrete hormones
13.2	How are chemical messages transported around the body?	Glands release <b>hormones</b> into the bloodstream which then travel to the target organ to produce an effect.
13.3	What is produced if <b>blood glucose</b> is a) <b>Too high</b> <b>b) Too Low</b>	a) Insulin b) Glucagon
13.4	Name 2 places in the body where glycogen is stored.	Muscles and Liver cells
13.5	What is the process called that restores the body back to normal levels?	Negative feedback
13.6	How is water lost from the body?	Urine, respiration, sweating and breathing
13.7	What is the function of the kidneys?	To filter the blood and remove waste materials such as toxins and urea
13.8	Name the hormones involved in reproduction (male and female)	Testosterone Oestrogen Follicle stimulating hormone Luteinising hormone
13.9	State the names and function of the hormones in the menstrual cycle.	FSH – matures the egg Oestrogen – Causes the uterus lining to thicken and stop FSH production LH – releases the mature egg
13.10	What are the 2 main categories of <b>contraception</b> ?	Physical barriers and chemical methods
13.11	Summarise the stages of IVF.	<ol> <li>Mother given FSH and LH to mature several eggs</li> <li>Eggs are collected from the mother and by sperm from the father in a lab.</li> <li>Fertilised eggs develop into embryos</li> <li>Some Embryos are inserted into the mothers uterus</li> </ol>
13.12	State 2 advantages and disadvantages of fertility treatment.	Disadvantages – emotionally and physically stressful, low success rate, multiple births Advantages – allows pregnancy when not possible, embryo screened for genetic disorders

# Section- the Brain and the eye (Triple Content)

1.	What is the brain made up of?	Billions of interconnected neurons.
2.	Name 3 main parts of the brain.	Cerebral cortex, cerebellum, medulla.
3.	Why is investigating the function of the brain difficult?	It is a complex and delicate organ.
4.	Name 2 ways scientists can investigate brain function.	<ol> <li>Electricity stimulating areas in conscious patients and recording their response OR</li> <li>Magnetic Resonance Imaging (MRI) scans 3.</li> </ol>
5.	Name the 2 main stimuli that the <b>eye</b> is sensitive to.	Light intensity and colour.
6.	Name the muscle that changes the shape of the lens in the eye.	Ciliary muscle
7.	Name the part if the eye which controls how much light enters through the pupil,	Iris
8.	Name the ligaments in the eye which help change the shape of the lens	Suspensory ligaments
9.	Name the part of the eye that allows light to enter through it.	Pupil
10.	Which part of the eye gathers information and takes it to the brain/	Optic nerve
11.	What happens to the suspensory ligaments and ciliary muscles when the eye focuses on a) a near object or b) a far object?	Near – Suspensory ligaments loosen, ciliary muscles contract Far – Suspensory ligaments tighten, ciliary muscles relax
12.	Name the 2 types of lens and how they used to treat myopia and hyperopia	Concave lens corrects myopia Convex lens corrects hyperopia

# Section – Thermoregulation and Osmoregulation (Triple Content)

1.	What monitors and regulates body temperature?	Thermoregulatory centre
2.	Name 2 ways the body responds if the temperature is too high.	Sweating, vasodilation, hairs lie flat
3.	How do these <b>responses lower</b> <b>temperature?</b>	Sweating causes evaporation from the skin to cool down Vasodilation allows more heat to be lost by radiation Hairs lie flat as not to trap an insulating layer of air
4.	Name 3 ways the body responds if the temperature is <b>too low</b> .	Vasoconstriction, shivering and hairs stand up
5.	How do these responses increase temperature?	Shivering – rapid contraction of muscles, which require energy through exothermic reaction respiration Vasoconstriction – limits heat loss by radiation Hairs stand up – trap an insulating layer of air
6.	What happens to an animal cell if it a) gains or b) loses too much water?	A) Burst/lysis B) Shrivel/shrink/crenation
7.	What is removed from the body by the kidneys in the urine?	Excess salts, Urea and water
8.	Excess amino acids are broken down into what?	Ammonia
9.	Which hormones controls the water balance and where it is made?	ADH made in the hypothalamus in the brain
10.	State 2 methods of treating kidney failure.	Dialysis and kidney transplant
11.	What is the effect of urine concentration and volume if a) ADH is released or b) ADH is not released?	<ul><li>a) Higher concentration, lower volume</li><li>b) Lower concentration, higher volume</li></ul>

# Section – Plant Hormones (Triple content)

1.	What is the <b>plant response to light</b> called?	Phototropism
2.	What is gravitropism or geotropism?	The response of a plant to <b>gravity</b>
3.	What is the role of gibberellins in plants?	Initiates seed germination.
4.	Which plant hormone controls cell division?	Ethene.
5.	Which hormone controls the ripening of fruit?	Ethene.
6.	In which industries are plant hormones used regularly?	Agriculture and horticulture.
7.	State 3 ways <b>auxin is used</b> .	<ol> <li>Weed Killers</li> <li>Rooting powders (to stimulate the development of the roots)</li> <li>Promoting the growth of plant tissue cultures</li> </ol>
8.	How is ethene used in the food industry?	To control ripening fruit during storage and transport.
9.	How are gibberellins used in industry?	<ol> <li>To seed dormancy</li> <li>To promote flowering</li> <li>To increase fruit size</li> </ol>
10.	What effect do auxins have on plants?	Auxins control growth of plants by promoting cell division and causing elongation in plant cells. Cells in stems grow more, cells in roots grow less.

## **Foundation Tier**

## Q1.

Blood is filtered in the kidneys.

Some substances are then reabsorbed.

The amount of each substance reabsorbed varies.

Each day, a person:

- filters 180 dm<sup>3</sup> of water out of the blood
- produces 2 dm<sup>3</sup> of urine.

The diagram shows the process of filtration in the kidney.



(a) Explain why protein is **not** found in the urine of a healthy person.

(b) Explain why glucose is **not** found in the urine of a healthy person.

(2)

(2)

#### (c) Explain:

- why urea and sodium ions are found in urine
- why their concentration is higher on a hot day than on a cold day.

(d) The information below gives some features of two types of treatment for kidney disease.

Dialysis treatment	
A dialysis session lasts about 8 hours.	
A person needs 3 dialysis sessions every week for the rest of their life.	
The person must have a diet low in protein and salt.	
Dialysis costs £30 000 per year.	
Kidney transplant	
A kidney transplant requires surgery using general anaesthetic.	
A suitable kidney donor is needed.	
A suitable kidney donor is needed. Drugs are used to suppress the immune system.	
A suitable kidney donor is needed. Drugs are used to suppress the immune system. A transplant, and the first year's medical care, costs £51 000.	

Evaluate the use of a kidney transplant instead of dialysis treatment for kidney disease.

\_\_\_\_

(3)

(6) (Total 13 marks)

## Q2.

Phototropism is a growth response by part of a plant to light.

(a) Name **one** other tropism.

Give the stimulus the plant responds to in the tropism you have named.

Tropism	
Stimulus	
	(2)

(b) Plan an investigation to show the effect of light from one direction on the growth of plant seedlings.

Include details of any controls needed.

You may use some of the equipment shown in **Figure 1** and any other laboratory apparatus.



(c)	Explain how phototropism in a plant shoot helps the plant to survive.	
		_
		_
		_
		_
	(Total 11	ma
5.		
Man	y functions of the human body are controlled by chemicals called hormones.	
Man (a)	y functions of the human body are controlled by chemicals called hormones. What is a hormone?	
Man (a)	y functions of the human body are controlled by chemicals called hormones. What is a hormone?	
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Man (a)	y functions of the human body are controlled by chemicals called hormones. What is a hormone?	_
Man (a)	y functions of the human body are controlled by chemicals called hormones. What is a hormone?	_
(a) (b)	y functions of the human body are controlled by chemicals called hormones. What is a hormone?	_

The graph shows changes in the concentration of glucose in the blood of a healthy person following a meal.



(c) Explain how negative feedback controls the blood glucose concentration during the first one and a half hours after the meal.



# **Higher Tier**

### Q4.

Water conservation is important to the human body.

(a) Which gland releases the hormone that controls water loss from the body?

Tick  $(\checkmark)$  one box.



(b) Which hormone helps the kidneys to control water loss from the body?

Tick  $(\checkmark)$  one box.



(1)

(c) A man is walking across a desert.

The man has used up his supply of drinking water.

Explain how the gland you named in part (a) and the kidneys reduce water loss.

_	
_	
_	
_	
_	
_	
-	
S	Some people have kidney failure.
[	Doctors may treat patients with kidney failure by either:
•	dialysis
•	a kidney transplant.
E	Explain <b>two</b> biological reasons why most doctors think that a kidney transplant is a petter method of treatment than dialysis.
[	Do <b>not</b> refer to cost or convenience.
F	Reason 1
_	
F	Reason 2
-	
_	

## Q5.

The human eye can focus on objects at different distances.

Figure 1 shows how a clear image of a **distant** object is formed in a person's eye.



(a) Explain how the person's eye could adjust to form a clear image of a **nearer** object.

Long-sightednes	s can be corrected by v	vearing spectacles.	
Long-sightednes	s can be corrected by v	vearing spectacles.	
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Long-sightednes Describe how sp	s can be corrected by v ectacle lenses can corr	vearing spectacles. ect long-sightedness	

## Q6.

Reflex actions are coordinated by the nervous system.

(a) What is meant by the term 'reflex action'?

(b) A woman's hand accidentally touches a hot object.

The woman moves her hand away rapidly.

(c)

Describe how the woman's nervous system coordinates the reflex action.

The endocrine system coordinates many internal functions of the body.
Give <b>three</b> ways coordination by the endocrine system is different from coordinatio
by the hervous system.
1
2
۲
3

(6)

(d) Describe how hormones control the menstrual cycle.



(Total 16 marks)

## Mark schemes

### Q1.

(a)	(molecules are) (too) large	1
	cannot pass through (filtration) membrane / (holes in) filter allow 'is not filtered out of the blood'	1
(b)	glucose is reabsorbed	1
	ignore 'is absorbed' unless qualified by 'into blood'	1
	<u>all</u> of it	1
(c)	(molecules / ions) small so pass through filter <b>or</b>	
	not all is reabsorbed	
	allow the body needs to maintain the right balance of ions and urea in the blood	
	ignore 'are filtered' unqualified	
		1
	more water reabsorbed on a hot day	1
	due to more water lost in sweat	
	'more' needed at least once to gain both marks	1
(d)	<b>Level 3 (5-6 marks):</b> A judgement, strongly linked and logically supported by a sufficient range of correct reasons, is given.	
	Level 2 (3-4 marks): A judgement, supported by some relevant reasons is given.	
	<b>Level 1 (1-2 marks):</b> Relevant points are made. If there is a judgement, this is asserted, but not logically linked to the points made.	
	No relevant content (0 marks)	
	Indicative content	
	<ul> <li>pro transplant:</li> <li>(dialysis requires repeated treatments to prevent) build-up of toxins or</li> <li>to prevent raised blood pressure between sessions</li> </ul>	
	inconvenience of dialucie of a long accelence of immehility or	

- inconvenience of dialysis, e.g. long sessions of immobility or ٠ repeated hospital visits
- (dialysis requires restricted diet) to prevent build-up of urea / ions there is a greater risk of infection with dialysis e.g. repeated • puncturing of skin or use of non-sterile equipment allows entry of

microorganisms

- there is a risk of blood clots with dialysis
  - dialysis more expensive in the long term / 2+ years **or**

examples given e.g. 2 yrs dialysis = £60 000 compared with 2 yrs after transplant

- $= (\pounds 51\ 000 + \pounds 5\ 000) = \pounds 56\ 000$
- transplant is a long term treatment or may remain healthy for many years

#### con transplant:

- shortage of kidney donors leading to long waiting time
- requires death of another person or live donation leaving a person with just one kidney
- exploitation of poor people for donor kidneys (paying for organs)
- need to match tissue type
- rejection role of wbcs / lymphocytes
- need immunosuppressant drugs susceptibility to infection
- dangers of surgery physical damage / infection / brain damage from anaesthetic
- high initial cost limited funding (either personal or NHS / CCG)

[13]

### Q2.

(a)	named example of tropism – e.g. geotropism / gravitropism allow hydrotropism <b>or</b> chemotropism <b>or</b> thermotropism	
		1
	correct corresponding stimulus – e.g. gravity allow water <b>or</b> chemical <b>or</b> 'heat'	1
(b)	<b>Level 3:</b> The method would lead to the production of a valid outcome. All key steps are identified and logically sequenced.	5-6
	<b>Level 2:</b> The method would not necessarily lead to a valid outcome. Most steps are identified, but the plan is not fully logically sequenced.	3–4
	<b>Level 1:</b> The method would not lead to a valid outcome. Some relevant steps are identified, but links are not made clear.	1–2
	No relevant content	0
	Indicative content	
	<ul> <li>several seedlings in each batch or one pot of seedlings in each batch</li> </ul>	
	<ul> <li>measure heights of shoots</li> <li>leave some in dark with light from one side / direction in box with hole</li> </ul>	

• control(s) with all-round light **or** rotating on clinostat **or** in dark

- control variable(s) e.g. same temperature / water / soil type
- after suitable time (at least several hours)
- record appearance of seedlings re. light direction
- re-measure heights of shoots
- detail of how bent shoots were measured e.g. use thread or straighten them out
- calculate mean height increase for each group
- use ruler / protractor to estimate angle of bending

for **level 3** a reference to comparing the growth of plants with light from one direction with plants either in darkness or in full light along with a control variable is required

(c) leaves / plant receive(s) / absorb(s) more light

(so) more photosynthesis

(so plant) produces more glucose

allow starch / carbohydrate / sugar / organic material / other named organic substance if no other mark awarded allow **1** mark for any two of the mark points with no reference to 'more'

[11]

1

1

1

### Q3.

- (a) any **three** from:
  - a (chemical) messenger

or

an organic substance

allow correct named example – e.g. protein / modified amino acid / catecholamine / steroid

made by the endocrine system / an endocrine gland / endocrine organ

allow made by / released from a (ductless) gland

- affects (a) specific / target organ(s) / tissue(s)
- released into the blood
   *allow carried by the blood*

3

(b) insulin **and** glucagon both required for **1** mark correct spelling only for glucagon

1

#### (c) Level 2 (3-4 marks):

Relevant points (reasons / causes) are identified, given in detail and logically linked to form a clear account.

#### Level 1 (1-2 marks):

Relevant points (reasons / causes) are identified, and there are attempts at logically linking. The resulting account is not fully clear.

No relevant content (0 marks)

#### Indicative content

 (0-0.5 h: ) glucose from meal enters blood or

increase in blood glucose (to 6.5 mmol / dm<sup>3</sup>)

- glucose detected by pancreas
- pancreas secretes insulin
- (insulin causes) glucose to move (out of blood) into cells / liver
- liver converts glucose to glycogen
- causing a fall in blood glucose (after 0.5h)
- low blood glucose (< 5.0 mmol / dm<sup>3</sup>) detected by pancreas
- pancreas releases glucagon
- liver converts glycogen to glucose (which enters blood)
- blood glucose rises (after 1 h or to 5.2 mmol / dm<sup>3</sup> (at 1.5 h))

[8]

#### Q4.

(a)	pituitary	1
(b)	ADH	1
(c)	allow ecf for name of hormone from part <b>(b)</b> ignore name of gland	
	high(er) concentration of blood <b>causes</b> (more) ADH / hormor release allow low(er) water potential of blood causes (more) ADH / hormone release allow alternative descriptions in terms of – eg low(er) water concentration / level <b>or</b> high(er) osmotic pressure <b>or</b> high(er) solute concentration / level	ne 1
	(and hormone / ADH causes) increased permeability of kidne tubules (to water) allow increased permeability of collecting duct / distal convoluted tubule	ey 1

### (so) increased water reabsorption allow more water taken back into blood ignore reference to urine

## (d)

	allow converse if clearly describing dialysis	
	explanation must match reason	
changes in minimised	n concentrations / levels of substances / urea are	
	allow no change in concentration / level of substances / urea	
	allow correctly named substances	1
(so) less /	no chance of causing damage to body cells / tissues allow eg less / no osmotic stress <b>or</b> not	
	poisoned by urea	1
not repeate	edly puncturing skin <b>or</b> blood not in contact with machine allow blood does not leave the body	
		1
(so) less / chance of	no chance of infection <b>or</b> less / no blood clots <b>or</b> no need to take anti-	
clotting dru	ugs allow less / no chance of	
	microorganisms entering body	
	allow only one operation so less chance	
	allow dialysis requires anti-clotting	
	drugs and so may lose more blood if cut	
	IOF 2 Marks	1

1

[9]

## Q5.

(a)	ciliary muscles contract	1
	(so ciliary muscles have a) smaller diameter	1
	(so) suspensory ligaments loosen / slacken do <b>not</b> accept 'relax'	1
	(so) lens thickens <b>or</b> lens becomes more curved / rounded allow lens becomes fatter ignore lens becomes bigger	1
		-

	(thicker) lens is more convergent allow light rays bent (inwards) more <b>or</b> light refracted more	
	-	1
	light rays / image focused on retina allow light rays meet on retina	1
(b)	eye(-ball) is (too) short <b>or</b> lens cannot be thickened enough allow ciliary muscles (too) weak <b>or</b> lens not (sufficiently) elastic	1
	(so) light 'focuses' behind retina allow (so) image forms behind retina	1
(c)	convex / converging lens allow shape described eg thicker in middle	1
	light rays bent / refracted (inwards) more allow changes direction of light rays further inwards	1
	light rays focused on retina allow light rays brought to a point on retina <b>or</b> light rays converge on retina <b>or</b> focused / clear image forms on retina	1
00		[11]
Q6.	response / reaction	
(a)	ignore examples	
	ignore action	1
	automatic <b>or</b> no thinking <b>or</b> not conscious <b>or</b> involuntary ignore reference to brain	
	ighore quick	1
(b)	receptor (in skin of finger / hand) detects stimulus / temperature change	
	allow receptor detects heat ignore pain	1
	(electrical) impulses pass along neurones allow electrical signals pass along nerve cells	-

	ignore messages	1
	(impulses pass from) sensory to relay to motor neurones	1
	synapse between neurones where chemical crosses gap allow neurotransmitter / acetylcholine for chemical allow by diffusion	1
	(synapses) in spinal cord / CNS ignore brain	1
	muscle contraction (to pull hand away) <b>or</b> effector is a muscle	1
(c)	coordination by endocrine system is: allow converse points if clearly indicating nervous co-ordination answers must be comparative	
	slower	1
	longer-lasting	1
	(chemical / hormone) via blood instead of electrical / impulse / neurones	1
(d)	FSH (release from pituitary) stimulates maturation of egg / ovum / follicle ignore reference to days of menstrual cycle allow FSH stimulates development / growth of egg	
	oestrogen (release from ovary) inhibits FSH production <b>and</b> stimulates LH production	1
	LH (release from pituitary) stimulates ovulation allow LH stimulates release of egg	1
	progesterone (release from ovary) inhibits FSH <b>and</b> LH production <i>allow (release from corpus luteum)</i>	1

oestrogen and progesterone maintain the uterus lining

allow oestrogen **and** progesterone build up the uterus lining

1 [16]