AQA GCSE BIOLOGY (HIGHER) · 8461

BIOLOGY



MARK SCHEME

4.5.1 HOMEOSTASIS (PACK 2)

SCORE	PERCENTAGE
/278	%

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Mark schemes

Q1.

(a) (i) lungs

1

(ii) skin

1

(iii) kidneys

1

(b) (i) (as sweat lost,) performance falls

1

(ii) drink water / sports drink

ignore antiperspirant

1

[5]

Q2.

(a) 4000

*award **both** marks for correct answer, irrespective of working*

*1500 + 2000 + 500 gains **1** mark*

2

(b) day 2 (no mark)

any **two** from:

*max **1** mark if correct day not identified or if no day given*

- more (water in) breath / breathing
- more (water in) sweat / sweating

accept a lot of sweating

- less (water in) urine

*if no other marks awarded allow **1** mark for more water lost on day 2*

2

(c) (i) respiration

1

(ii) cools / removes heat owtte

ignore 'maintains body temperature' unqualified

1

(iii) osmosis

1

[7]

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Q3.

(a) any **two** from:

- amylase / carbohydrase
- protease
  allow trypsin
- lipase

2

(b) (i) high / above normal blood sugar
or cannot control blood sugar
allow other symptoms
*eg frequent / plentiful urination **or** sugar in urine **or** thirst **or** weight loss **or** coma*
ignore consequential effects eg blood pressure / circulation / glaucoma / tiredness

1

(ii) any **one** from:

- small / regular meals
- low sugar (meals) or low GI / GL **or** carbohydrates as starch
  allow high fibre
  ignore reference to low carbohydrate

1

(iii) any **one** from:

- keep constant(blood) sugar **or** prevent high (blood) sugar **or** reduces surge / rush of sugar into blood
- reduce the need for insulin

1

(iv) (take) insulin
allow pancreas transplant

1

(c) protein / hormone / enzyme synthesis **or** synthesis of named example **or** combine amino acids

1

[7]

Q4.

(a) (i) thermoregulatory centre (in brain)
accept hypothalamus

1

(receptors sensitive to/measures) temperature of <u>blood</u>

1

(ii) any **one** from:

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- receptors (in skin)
- (skin) sends information / signals / impulses / messages to brain / thermoregulatory centre

1

(b) any **three** from:

(cold conditions)

- muscle (X) contracts when cold
- no / less blood through capillaries
- no / less heat lost / radiated
- no / less sweat produced

(hot conditions)

- muscle (X) relaxes/does not contract when hot
  *NB X contracts when cold and relaxes when hot = **2 marks***
- (more) blood through capillaries
- more heat lost / radiated
- more sweat produced

all other points must be clearly identified by correct conditions

*max **2** if idea of capillaries moving but ignore capillaries dilate*

3

[6]

-

Q5.

(a) (i) bladder

1

(ii) glucose

1

protein

extras – CANCEL

1

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

- kidney functions all the time / not just 3 × 8 h sessions a week

allow direct quotation of correct points from the list

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- can eat high-protein foods / high salt foods
  allow can eat anything
- cheaper
- waste of time

2

(ii) have to take (immunosuppressant) drugs / consequence of this
eg catch infections / may suffer brain damage / possible rejection of kidney **or** become ill more easily
or
risk of brain damage (due to anaesthetic)
allow direct quotation of correct points from the list

1

(c) (i) urea

1

(ii) 4.2

1

[8]

Q6.

(a) any **three** from:

- glucose enters blood from gut / liver / glycogen
- glucose is <u>filtered out</u> of the blood
  ignore 'diffusion'
- glucose is (a) small (molecule)
- taken / etc back into the blood / reabsorbed
  *allow absorbed into the blood but **not** absorbed unqualified*
- by active transport
  ignore diffusion

3

(b) (i) <u>in a healthy person</u>

protein not present because proteins are large (molecules)
or because cannot pass through (filter)

1

<u>in person with disease</u>

lets protein through (filter) owtte

1

(ii) <u>advantages</u>:
up to any **three** from:

- no build-up of toxins / keeps blood conc. ± constant
  ignore 'kidney works all the time'

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- prevent high blood pressure
- don't need restricted diet / restricted fluid intake **or** time wasted on dialysis
- blood clots may result from dialysis
- infection may result from dialysis
- with dialysis, blood may not clot properly due to anti-clotting drugs
- cost issues (ie transplant cheaper)

3

disadvantages: **at least one** from:

- rejection / problem finding tissue match
- use of immuno-suppressant drugs → other infections
- dangers during operation / example described

must have at least one advantage and at least one disadvantage for full marks

1

[9]

Q7.

(a) (i) 1400

*award **2** marks for correct answer if no working shown*
*2400 – (300 + 600 + 100) or equivalent for **1** mark*

2

(ii) $\frac{1}{3}$

1

(b) **A**: chemical reactions

B: food

C: drinking

*all **three** required for **1** mark*

1

(c) cools / reduces temperature

allow 'maintaining body temperature' owtte
*do **not** allow regulate unqualified*
ignore reference to urea
numerical references to temperature should be correct

1

(d) more sweat produced

1

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less urine produced

1

[7]

Q8.

(a) pancreas

1

(b) protease

allow proteinase

1

(c) (i) (same) enzymes / named enzymes produced in other parts / named parts of digestive system

if named, enzymes and part must be correct

1

(ii) diet / activity varies / amount of glucose in blood varies

accept too much insulin leads to coma / hypo / low blood sugar

accept too little insulin leads to coma / hyper / high blood sugar

1

(d) any **two** from:

pros

- less / no experimentation on humans
- dogs (more) similar to humans (than lower / named organisms)
- it allows us to find a treatment **or** improves medical understanding

accept allows us to find a cure

cons

- harmful / cruel to dogs

accept kills dogs

- dogs may not be (metabolically) like humans

2

conclusion justified by argument

1

[7]

Q9.

(a)

glucose ☑

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urea ☑

water ☑

sodium ions ☑

protein ☐

*all 3 correct = **2** marks*
*2 correct = **1** mark*
*0 or 1 correct = **0** marks*

max 2

(b) (i) protein cannot pass through filter

or

protein (too) large

or

protein stays in the blood

1

(ii) reabsorbed

1

(c) (i) less

1

(ii) more

1

[6]

Q10.

(a) (i) protein is large (molecule) / too big to pass through filter

1

(ii) glucose is present in the filtrate
ignore units

1

or

0.8 in filtrate

no glucose is present in the urine

or

0 in urine

1

(iii) active transport – up / against (concentration) gradient

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it = active transport throughout

1

or

from low to high (concentration)

uses energy / ATP

*accept needs specific carrier / specific protein (in cell membrane) for **1** mark*

1

(b) water reabsorption / taken out

other substances cancel mark

or

water taken into blood / body

1

[6]

Q11.

(a) 94.8

1

(b) (i) to cool (the body) / maintain (body) temperature

*do **not** accept let out heat*

1

(ii) water **and** ions

1

(iii) water ignore CO_2, and vapour

1

(c) any **two** from:

used in respiration

provides energy

(energy) needed for movement / running / muscle action

2

[6]

Q12.

(i) dialysis (machine) or kidney machine

1

(ii) (specially chosen kidney) similar tissue type

accept same blood group

1

(irradiation of bone marrow) to stop white cell production

allow any named white blood cell

1

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(treated with drugs) suppress immune system

1

(sterile conditions) avoid exposure to pathogens / infection

1

[5]

Q13.

(a) (i) 6

1

(ii) 4

1

(b) (i) pancreas

ignore islets of langerhans

1

(ii) 'X' anywhere between >1 and ≤ 2 hours

anywhere in that column

1

(c) any **four** from:

water movement

*do **not** accept solution*

out of cells

dilute to concentrated solution

accept reference to correct gradient -
*high Ψ to low Ψ **or** high to low 'water concentration'*
*must be unambiguous – i.e. **not** 'high to low concentration'*
accept low to high concentration

reference to partially / selectively permeable membranes **or** described

cells shrink / get smaller

allow crenated
ignore plasmolysed / flaccid / floppy
etc

4

[8]

Q14.

(a) (i) glucose passes through the filter / from plasma to filtrate

ignore diffuses

1

(ii) glucose is reabsorbed or glucose taken back into the blood

ignore filtered

1

(b) protein (molecules) are (too) large (to pass through the filter)

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1

(c) any **three** from:

<u>blood</u> becomes more concentrated / too salty / has lower water potential **or** too little water in the <u>blood</u>

hypothalamus detects this

release of ADH

by pituitary

increased **<u>re</u>**absorption of water

3

[6]

Q15.

(a) urea

1

(b) any **four** from:

- suitable for short term
  accept reverse arguments with respect to transplants
- no long term drug treatment
- no rejection chance
- no / less risk during surgery
  accept risk of anaesthetic
- operations unsuitable / risky for weakness / old age
- risk of infection
- no (suitable) kidneys available for transplant / long waiting list /
- ess painful

4

[5]

Q16.

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

- <u>chemical</u> messenger
- <u>chemical</u> / <u>substance</u> released in one part to have effect elsewhere in body
- <u>chemical</u> / <u>substance</u> which affects another / target organ / tissues / cells
  allow <u>chemical</u> from <u>endocrine</u> gland

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1

(ii) in blood / circulatory system / any named part including plasma

extra wrong answer would cancel example

***not** red blood cells*

1

(b) **Quality of written communication**:
correct use of at least two relevant scientific term**s** spelt phonetically

e.g. pregnancy, ovulation, FSH, oestrogen, progesterone, ovary, follicle, circulation, thrombosis, feminisation, sperm count, STD

Q ✓ or Q ✗

1

any **three** from:

Oral contraceptives:

(benefit)

- prevent (unwanted) pregnancy **or** prevent egg release
- regulate menstrual cycle / periods

(problems)

- prolonged use may prevent later ovulation / cause infertility
- named side-effect on female body
  e.g. circulatory problems / weight gain / nausea / headache / breast cancer / mood swings
- increased promiscuity / increase in STD's / STI's
- named side-effect on environment
  e.g. feminisation of fish **or** lowered sperm count in human males

Fertility drugs:

(benefit)

- can enable woman to have children **or** to become pregnant **or** stimulates egg release

(problem)

- multiple births

*for full marks must score at least **one** re contraceptives **and** at least **one** re fertility drugs*

*if unclear which type of hormone maximum **2** marks from 3*

3

[6]

Q17.

(a) (i) respiration

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1

(ii) 9600

if correct answer, ignore working / lack of working

$\frac{80 \times 12000}{100}$ *for **1** mark*

2

(b) any **three** from:

- dilates / widens **or** muscle in wall relaxes **or** sphincter opens
  *do **not** accept expands or just gets bigger*
- more blood flows near skin surface **or** more blood through capillaries
- heat lost by radiation / convection / conduction
  ignore evaporation
- heat loss from blood / cools blood

3

(c) hypothalamus / brain

1

[7]

Q18.

(a) aerobic

1

respiration

*'anaerobic respiration' = **1** mark*

1

(b) any **five** from:

- glucose is a small molecule
- glucose passes through filter **or** glucose is filtered out of blood **or** glucose enters the capsule / kidney tubule / Q
- glucose reabsorption **or** glucose taken (back) <u>into blood</u>
  *do **not** accept '<u>filtered</u>' into blood / out of tubule*
- cells lining tubule have microvilli / shape described **or** cells lining tubule have large surface area
- active transport
- up concentration gradient
- use of energy / ATP
- long tubule for more reabsorption

5

[7]

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Q19.

(a) (i) (predator) lion

1

(prey) antelope

1

(ii) light

accept other positive indications

1

(iii) in sequence (top to bottom):

lion
antelope
grass

1

(b) (i) bacteria / fungi / saprotrophs

accept moulds / decomposers / microorganisms / microbes / saprophytes / saprobionts

1

(ii) aerobic

1

moist

1

warm

accept other positive indications1

1

(iii) carbon dioxide

1

mineral salts

1

[10]

Q20.

(a) 345 to 350

ignore working or lack of working
*use of 355 to 360 **and** 10 for **1** mark*

2

(b) any **two** from:

more sweating (at 37.6 °C)

'more' at least once in the first 2 points

more water loss **or** dehydration occurs

*do **not** accept prevents dehydration only*

blood becomes (more) concentrated / (more) salty **or** need to replace water

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stimulation of the hypothalamus

2

(c) any **three** from:

evaporation

of <u>water</u>

*do **not** accept just water loss unqualified*

cools skin **or** uses heat from skin

cools blood / heat from blood (passing through skin)

related to sweating
cooling the blood
ignore vasodilation

3

[7]

Q21.

(a) semi / selectively / partially / differentially permeable

1

separates blood and dialysis fluid

1

(b) any **four** from:

blood cells cannot pass through membrane

glucose retained in blood

to stop water passing into blood / osmosis

no (net) diffusion

urea removed from blood by diffusion

accept excreted

4

(c) problem may be temporary **or** has minor infection **or** problem could be cured by other means

1

operation / transplants carry risk

accept rejection

1

(d) (i) no antigens

1

on (the surface) of red blood cells

1

(ii) would cause agglutination / clumping if different

ignore clotting and coagulation

1

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[11]

Q22.

(a) water content (within the body/blood) is kept constant/ regulated/within very narrow limits/kept right

*do **not** accept general definition of homeostasis*

1

(b) because optimum conditions are needed for processes within the body / enzyme reactions
or
because there is a need to maintain a steady internal environment

1

(c) excretion is the removal from the body of waste **products**

n.b. faeces is not an excretory product but may be neutral

1

because waste products would (build up and) **become** toxic/poisonous/harmful

*do **not** accept makes us ill*
*do **not** accept block up system*
*do **not** accept unwanted products*

1

[4]

Q23.

vasoconstriction/blood vessels near surface get narrower/decreased blood supply near surface of the skin **or** closing sweat pores

any three pairs. 2 marks for each pair of features and explanations up to a maximum of 6 marks

(which) prevents the heat being lost from the blood/prevents heat lost due to evaporation

explanation must match feature to score the second mark

---

hair/fur stands on end **or** goosepimples

(this) increases the insulation effect

---

shivering/increased muscular activity/movement/increased metabolism

(this) generates heat

*do **not** accept raise body temperature*

---

behavioural changes/find somewhere warm/put on clothes / huddling / hibernate / grow **extra** fat / fur

(this) prevents/reduces heat loss

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*do **not** accept keep warm*

[6]

Q24.

(a) (i) endocrine glands **or** endocrine system

allow a specific named gland

1

(ii) (dissolved) in the blood(stream) **or** plasma

1

(b) (i) pancreas **or** islets of Langerhans

1

(ii) (it **or** insulin) lowers blood sugar level [1]

(by) (speeding up **or** increasing) conversion of glucose to glycogen [1]

in the liver [1]

(and) speeding up **or** increasing uptake of glucose by body cells [1]

4

[7]

Q25.

(i) liver

1

(ii) liver **or** B stores glycogen
or pancreas **or** D makes insulin

1

clear description of link

1

[3]

Q26.

(a) (i) squirrels eat nuts;

each for 1 mark

owls eat squirrels

(2 marks for energy flow)

2

(ii) hazel tree

gains 1 mark

1

(iii) 1 squirrel population would decrease;
because fewer nuts available as food

each for 1 mark

2

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2 owl population would decrease;
because fewer squirrels available as food
each for 1 mark

2

(b) (i) digested/broken down;

(ii) by microbes/reference to worm action;
each for 1 mark

2

(iii) March
warmer/increased activity of worms/microbes;
each for 1 mark

2

[11]

Q27.

(a) oxygen;)
carbon dioxide;) *allow symbols*
water)
each for 1 mark

3

(b) graph with reasonable vertical scales;
accurate plotting of all points (ignore lines) and labelling lines
histogram – must be coded
gains 3 marks

3

(c) 6 of:
during exercise the level of CO_2 (in the blood) rises;
increased breathing to remove excess CO_2;
increased oxygen supply to muscles;
or increased breathing takes in more O_2
or increased heart rate takes more O_2 to muscles;
increased supply of sugar to muscles;
increased respiration rate;
enable faster rate of energy release;
reference to lactic acid (allow even though not on syllabus)/O_2 debt;
to avoid cramp;
anaerobic reference;
reference to removal of 'heat';

6

(d) high carbon dioxide concentration;
brain/central nervous system;
heart muscles (both)

3

[15]

Q28.

(a) (i) increased shortly after ingestion then drops;

(ii) decreased shortly after ingestion then rises;

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(iii) decreased shortly after ingestion then rises

each for 1 mark

3

(b) 8 of:
ingestion of ice cools blood flowing in (gut wall);
brain temperature lowered;
reduced blood temperature detected by brain;
impulses sent to sweat glands;
sweat production decreased/sweat pores close;
evaporation of sweat reduced;
it is evaporation of sweat which cools skin/heat loss is less;
therefore skin temperature rises;
because external temperature greater than body temperature;
sensibly linked example;

each for 1 mark

8

[11]

Q29.

(a) (i) vole/small bird/beetle

gains 1 mark

1

(ii) oak trees are large organisms;
therefore their biomass is large; but their numbers are small

each for 1 mark

3

(b) 8 of:
energy stored in chemicals in cells/tissues/growth;
passed up food chain;
less energy stored at each stage in food chain/pyramid level;
because only part of energy taken in used for growth;
some lost in waste;
some used for repair;
used to main body systems;
some lost in respiration;
some converted into other forms of energy;
e.g. movement;
much lost as heat;
by time detritus feeders have used remains;
all returned to environment

each for 1 mark

8

c1 → animals
c2 → decomposers

2 marks for sequencing and organising the information

2

[14]

Q30.

(a) (i) transport of substances **or** named substance **or** blood around the body

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each for 1 mark

2

(ii) breaks down *(**not digests**)* food absorption (into blood)

each for 1 mark

3

(b) water filtered from blood
smaller proportion reabsorbed
therefore larger volume
of dilute urine produced

each for 1 mark

4

[9]

Q31.

(a) water filtered from blood
smaller proportion reabsorbed therefore larger volume of dilute urine produced

each for 1 mark

4

(b) (i) use of dialysis machine which restores concentrations of substances in blood to normal levels
transplant of healthy kidney **or** compatible kidney

each for 1 mark

4

(ii) 5 of e.g.:
dialysis needs much time attached to machine
consequent effect on lifestyle (qualified) need for special diet
transplant gives 'normal' life (qualified)
transplant cheaper in long term
risk attached to transplant operation
shortage of donors etc.

each for 1 mark

5

[13]

Q32.

8 of e.g.:
muscles release energy as heat
blood flowing through muscles heated increased blood temperature sensed by centre in brain
impulses to skin blood vessels
particularly overlying muscles used in exercise to dilate
increased surface flow in these regions
gives pattern shown on thermographs

each for 1 mark

[8]

Q33.

(i) 2500 – 1000
= 1500

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for 1 mark each

2

(ii) 3 of
filter blood
reabsorb water
in sufficient quantities to keep body water content constant
produce dilute urine if water content of body high/reverse argument

any 3 for 1 mark each

3

[5]

Q34.

(a) (i)
- blood sugar rises because
- insufficient insulin secreted by body

for 1 mark each

2

(ii)
- increase in rate of conversion
- of glucose to glycogen
- in liver

for 1 mark each

3

(iii)
- muscles use more glucose from blood
- in respiration
- to release energy needed for exercise

for 1 mark each

3

(b) 3 of
sugar soluble
therefore absorbed
quicker than starch
which has to be digested

any 3 for 1 mark each

3

(c)
- increased secretion of glucagons
- by pancreas
- results in increases rate of conversion of glycogen into glucose

for 1 mark each

3

(d) 3 of e.g.
higher blood sugar level results in increased secretion of insulin
effect of insulin is to lower blood sugar
which in turn reduces rate of insulin secretion
overall result is to keep fluctuations in sugar level to a minimum

any 3 for 1 mark each

3

[17]

Q35.

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(a) urine

for 1 mark

1

(b) (i) protein

for 1 mark

1

(ii) e.g. molecules too large

for 1 mark

1

(c) reabsorbed into blood

for 1 mark

1

(d) e.g. most of water reabsorbed but little urea

for 1 mark

1

[5]

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