

TRIAL HSC BIOLOGY EXAMINATION

2001

ANSWER BOOKLET

NAME:STAFF.....

NUMBER:

ATTEMPT ALL QUESTIONS.

SECTION 1

Part (a) Questions 1 – 15

Place a cross (x) in the most appropriate space.

	A	B	C	D
1				X
2			X	
3		X		
4			X	
5		X		
6	X			
7		X		
8			X	
9			X	
10	X			
11			X	
12				X
13			X	
14				X
15				X

max x A/cw
nN

Question 16. (5 Marks)

- a) (i) kidney question says organ: not nephron glomerulus etc
- (ii) reabsorption to maintain homeostasis / ^{1/2} too broad on own conc. of water + salts
- (iii) protein, RBC
glucose Keep it simple
- (iv) used
water some reference to stable cond + eg
- b) It maintains the blood water level - if there is low water level, more water is reabsorbed into the tubules, less water is excreted & urine is more concentrated, & if there is a high water level, urine is more dilute as less water is reabsorbed & so less water goes into the blood.

Question 17 (6 Marks)

- a) (i) Oxygen, glucose be specific not protein → a.a.
- (ii) CO₂ (mostly as HCO₃⁻) & H₂O wastes not just excess salts
- b) Both consists of long tubing which extends through & their tissues (in solution) not just explain what a transport system is i.e. it transports stuff needs to be specific

c)

Vessels

Mammals

arteries
veins
capillaries

if state
xylem should
state type
vessel for
water

Flowering
plants

xylem (1/2)
phloem (1/2)

x - water + mineral ions
p - sucrose solution

sun → transpiration
ATP → respiration

nutrients
transported

O₂, glucose, a.c.,
vitamins, antibodies
water, RBC, WBC,
hormones.

respiration (ATP) → heart,
muscles

energy
source
fast transport

choose to
very diff.
paths
short
route
to transport
in R

- Describe one way - relate to homeostasis
be specific
- d) waste products are transported to the kidneys
for excretion eg urea is carried from liver by the blood to kidneys for removal in urine OR hormones eg cortisol, ADH transported in blood to target organs to maintain water & salt balance.

Question 18 (4 Marks) $\frac{1}{2}$ if too general

stimulus = lowered CO_2 levels in the blood
↓
receptor = aortic carotid chemoreceptors monitor CO_2 chemo & stretch receptors in brain stem
↓
control centre = brain
↓
effectors = diaphragm (intercostal muscles, abdominal muscles)
↓
response = decreased / shallower breathing
(1 for set out)

(b) Negative feedback - an increase in some factor is sensed & lowered eg lowered levels CO_2 is sensed & breathing rate is decreased (increases CO_2 level in blood).

Question 19 (6 Marks)

- a) named species genetically altered: genetically modified salmon, impact of the use of genetic engineering on diversity of species

In the short term it would seem like an increase in genetic diversity. However, in the long term if the organism is successful (eg if released or escape into the wild population they may wipe out other fish populations or transfer their genetically engineered genes to wild population. This will then see a reduction in the wild population & a decrease in genetic diversity will occur. The creation of new genetic combinations may occur to the point where the original genes may be lost from the population & that species may be vulnerable if environmental conditions change.

b) (see previous page)

Question 20 (6 Marks)

- a) In the ancestral population of echidnas there were ^{no mutations - 1/2} variations - some of the more advantageous characteristics which allowed them to survive, reproduce. e.g. possession of more spines had a survival advantage, they passed this on to offspring, which over many generations meant an increasing number with this favourable variation.
- b) to convergent evolution e.g. seals & dolphins ^{both have} limbs modified as flippers, strong swimmers, thick layer of fat, because they occupy a similar niche. similar characteristics are selected by natural selection in quite different orders of mammals.
- c) new technology ^{for technology} biochemical evidence e.g. looking at amino acid sequence in proteins of haemoglobin & DNA hybridisation reveal humans & chimpanzees are more closely related than either is to gorillas. Previously due to fossil evidence & comparative anatomy it was thought gorillas & chimps more closely related than either to humans. ^{could get 2/3 for divergent ev. correctly explained}

Question 21 (9 marks)

- a) $2N=14$ indicates 7 pairs of homologous chromosomes. The 7 characteristics could be determined by gene pairs on the 7 different pairs.
- b) - a problem for dihybrid ratio, not monohybrid.
- Yes if some alleles were linked they would be inherited together. e.g. $\frac{TR}{tr}$ could produce only 2 types of gametes TR or tr but if assorting independently on different pairs of chromosomes $TtRr$ could produce 4 gametes TR, Tr, tR, tr. Mendel would not have got the same results. (essay over would have further complicated the issue)

$\frac{TR}{tr}$

$\times \frac{TR}{tr}$

TR or tr

TR or tr

$\frac{TR}{TR}$

$\frac{TR}{tr}$

$\frac{tR}{tr}$

$\frac{tr}{tr}$

experimental factors-

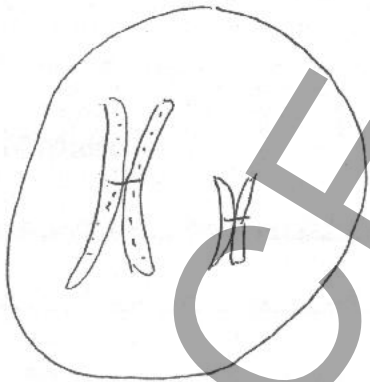
- c) aspects which led to his success included: pea plants are self pollinating, he could cross pollinate by hand, the characteristics were each determined by a single pair of genes that were located on separate chromosomes, Mendel repeated his experiments many times, & kept records of thousands of offspring, applying mathematics to his results. Started with pure breeds

Question 22 (3 Marks)

- a) there was no advantage in having the antibiotic resistance in an antibiotic-free environment. numbers low of antibiotic resistant bacteria. (mutations are so few with this trait (may be at a disadvantage too))
- b) there is an increase in the numbers of antibiotic resistant - they survive & reproduce bacteria & a decrease in the normal E. coli bacteria - die out
- c) theory of evolution by natural selection. (penicillin e.g. would need a small population many more generations to recognize)

Question 23 (2 Marks)

Q24
(a)

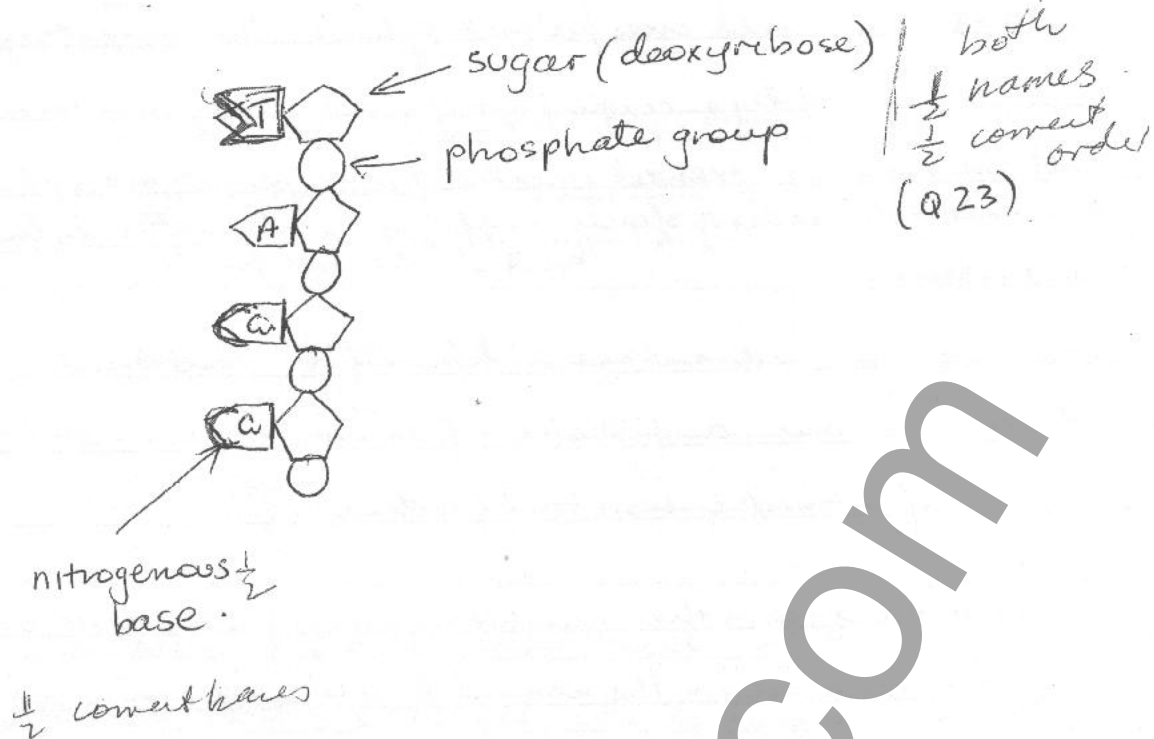


(b)



Question 24 (2 marks)

a)



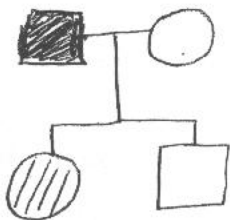
b)

Question 25 (3 Marks)

B_1 = black
 B_2 = yellow

a) $P: X^{B_1} Y \times X^{B_2} X^{B_2}$
 gametes X^{B_1} or Y X^{B_2}
 F_1 $X^{B_1} X^{B_2}$ $X^{B_2} Y$
 tortoiseshell & yellow coat colours 1

b)



= black
 = yellow
 = tortoiseshell

only these types

but could have any number of them

1 correct pedigree

1 code

If did a punnett square or cross instead of pedigree the could still get 1 for key/code

Question 26 (4 Marks)

a) He provided nutrient solution for the microbes to grow
 + His flask had a curved neck which allowed entry of air but trapped any microbes in the curve preventing decay of broth.
 any 3 "He boiled the nutrient solution for several minutes & thus killed any microbes that were in curved tube".
 • He allowed the flask to stand for a long time before the neck was broken. This allowed sufficient time for spontaneous generation to occur if it was to happen at all.

Breaking the neck at A allowed direct entry of bacteria thus causing decay

b)

Flask
control: same contents & boiled in
same way as Pasteur's flask. However the
control flask would have an uncurved
tube protruding straight up from the flask.

together they will show if it takes a month
before decay shows

Question 27 (4 Marks)

a) Obtain 2 agar plates ^{nutrient} that have been sterilized & sealed
for 5 mins then seal.
One plate is exposed in the classroom the other is kept sealed.
(control). Place both plates in a warm place or incubator ^{encourage growth} for
48 hrs & examine them. The "open" plate shows bacterial
& fungal growth but the control plate remains clear.
This shows that the air is full of microorganisms. ^{result not messy}

b) The bacterial colonies are ^{small} shiny and often cream or yellow
the fungal colonies: fuzzy appearance, large size
usually grey, dark green, black.
OR microscopic examination
bacteria - prokaryotic (no nucleus) fungus - eukaryotic nucleus

a) (3 Marks)

Propagation by seeds! This is sexual reproduction

which produces genetic variation in the offspring

In a changing environment favourable characteristics can be selected & passed on. This enables the species to survive.

b) (6 Marks)

(i) A plasmid would be extracted from *E. coli*. A restriction enzyme would be used to cut the plasmid & the gene for human growth hormone at the same place, leaving "sticky ends". The growth hormone gene would then be spliced into the plasmid and the recombinant plasmid would be inserted into *E. coli* where it would replicate as the bacteria multiplied. Human growth hormone is synthesised by the bacteria & can then be extracted from the bacteria.

(ii) The gene is cloned using recombinant DNA (gene is cut & spliced into bacterial plasmid from human genome). A radioactive probe of the complementary base sequence which can pair with the original gene (PCR and hybridisation): Autoradiography (stains & fluorescent dyes) can reveal the binding site. The ordering of the genes is achieved by gel electrophoresis & probes which allows the sorting of the fragments of chromosomes.

cut using restriction enzymes
sorted gel electrophoresis
Southern blotting
Radioactive probes

JRAHS - Biology Trial HSC Answer Booklet
photography film (autoradiography)

cloned gene (recombinant DNA)

↓
make a probe for a gene (complementary sequence)
↓
probe binds to gene identify its position on a (hybridisation)
particular chromosome
↓
autoradiography - position revealed

protein / polypeptide
collisions
derived

Question 28 (2 Marks)

should state where eg infect
alimentary canal - digestive
lysozyme
eye

- a) by hydrochloric acid in the stomach destroying
microbes & by antimicrobial action of saliva.
(lysosomes)
- b) hairs in nose trapping organisms which can be expelled
by sneezing OR Sticky mucus is produced & traps dust particles & pathogens.
Alia sweeps the mucus to back of throat where it is swallowed or coughed out

Question 29 (4 Marks)

- The bacteria A or B should be always present in every
diseased organism
- The microbe should be isolated from the diseased
organism & grown in pure culture - it would
resemble either A or B.
- Microbes taken from the pure culture should be
injected into healthy ^{only not!} organisms (without disease) & they must
produce the disease
- Microbes are isolated from these organisms, grown
in pure culture & compared with the microbes in
original culture & with A or B on plate & should
be identical.

c) (6 Marks)

i) ribosome

ii) UAC

iii) DNA RNA

• Sugar is deoxyribose

• Sugar is ribose

• Bases: A G C T

• Bases A G C U

• double stranded

• single stranded

iv) The sequence of bases in DNA is transcribed into a sequence of

bases in m-RNA. Each aa is brought to ribosome by t-RNA molecule. Amino acids are assembled in order specified by m-RNA. Thus DNA is translated into a sequence of a.a + hence DNA determines which protein is formed.

d) (3 Marks)

a) A + B are closer together than A + D & the chance of them being separated by crossing over is low.

b) A + B are linked on the same chromosome & are not going to be separated when chromosome pairs randomly segregate. A + C may ~~seg~~ have the chromosome ^{genes don't segregate} segregate together or A + C.

e) (2 Marks)

P: $i i R h^+ r h^-$ x $I^B i r h^- r h^-$

gametes $i R h^+$ or $i r h^-$ $I^B r h^-$ or $i r h^-$

F₁ $I^B i R h^+ r h^-$, $i i R h^+ r h^-$, $I^B i r h^- r h^-$, $i i r h^- r h^-$ (genotype)
 $B R h^+$, $O R h^+$, $B r h^-$, $O r h^-$ (phenotypes).

↑
 (phenotypes)
 preferably do not do separately.

f) (5 Marks)

(All cells contain all the information to produce all types in their nucleus)

(i) Genes can be turned on or off & control cell differentiation

Gene expression is influenced by (i) the position of that cell in the embryo (chemicals from neighbouring cells can diffuse into a cell, altering the expression) (ii) the presence of certain proteins (activators/repressors) which interact with DNA causing genes to be switched on or off.

(ii) Certain parts of the body require the switching on of many genes
eg in limb formation, in mammals a sequence is turned on one after the other (proteins produced by each gene regulates expression of the next)
eg genes for the control of blood vessels, nerves, muscles etc.

(iii) or homeotic genes - many species share these genes.

These indicate common ancestry eg yeast & humans share certain "homeotic genes" eg genes that control embryonic development in many different species.