Trinity College

SCIENCE DEPARTMENT

YEAR 11
HUMAN BIOLOGY EXAMINATION
SEMESTER 2, 2009

Student Name: Answer Key. Form: 2009.

TIME ALLOWED FOR THIS PAPER

Reading time before commencing work: 10 minutes
Working time for paper: 180 minutes

MATERIALS REQUIRED / RECOMMENDED FOR THIS PAPER

TO BE PROVIDED BY THE SUPERVISOR

Multiple Choice Question Booklet
Multiple Choice/Essay Answer Booklet
Short Answer Book

TO BE PROVIDED BY THE CANDIDATE

Standard items: **Pens, pencils, eraser or correction fluid, ruler**
Special items: **A 2B, B or HB pencil for the separate Multiple Choice Answer Sheet and calculators satisfying the conditions set by the Curriculum Council for this subject.**

IMPORTANT NOTE TO CANDIDATES

No other items may be taken into the examination room. It is your responsibility to ensure that you do not have any unauthorised notes or other items of a non-personal nature in the examination room. If you have any unauthorised material with you, hand it to the supervisor before reading any further.

QUESTION 41 (5 marks)

Question 41 refers to the list of words below.

LIST OF WORDS
autosome
gene
allele
chromosome
gamete
trait
karyotype
phenotype
genotype
X linked
heterozygous
homozygous

Using the most appropriate word from the list above complete **EACH** of the following definitions.

allele = an alternative form of a gene.

genotype = the genetic makeup of an individual for a particular trait.

Heterozygous = having two different alleles for a given trait.

Phenotype = the outward appearance of an organism.

Autosome = chromosome not involved in sex determination.

(5 marks)

QUESTION 42 (7 marks)

For EACH of the examples listed below **circle the type of immunity** involved.
(NOTE THAT 2 WORDS SHOULD BE CIRCLED IN EACH BOX)

all or none.

(a) An adult who had previously suffered with measles is again exposed to the measles virus but does not develop any symptoms of the disease.

(Active) OR Passive AND Artificial OR (Natural)

(1 mark)

(b) An adult having been vaccinated against tuberculosis becomes immune to the disease.

(Active) OR Passive AND (Artificial) OR Natural

(1 mark)

(c) A baby, not breast fed, is exposed soon after birth to the measles virus but does not develop any symptoms of the disease.

Active OR (Passive) AND Artificial OR (Natural)

(1 mark)

(d) Explain why the baby mentioned in Question 42 (c) does not develop the symptoms of the disease.

Antibodies / immunoglobulins against the measles virus in the mother's blood cross the placenta (1) conferring immunity (1)

(2 marks)

QUESTION 42 (continued)

(e) If the baby mentioned in Question 42(c) had been breastfed it may have been more immune. Explain why.

Colostrum / breast milk (1) contains antibodies / immunoglobulins against the virus (1).

(2 marks)

QUESTION 43 (13 marks)

A drug company has developed a new influenza vaccine that is squirted into the nasal passages. The vaccine has been approved for testing in people, to see if it prevents the symptoms of influenza in people at risk of infection. Consider how an experiment might be designed to test this vaccine, and answer the following questions.

(a) State a suitable hypothesis for this experiment.

Administration of the vaccine to people at risk of influenza will prevent symptoms of the disease

(If/then format acceptable)

variable / cause / variable

(1 mark)

(b) What would be the independent variable in the experiment?

The vaccine

(1 mark)

(c) What would be the dependent variable in the experiment?

The symptoms of influenza.

(1 mark)

QUESTION 43 (continued)

(d) In this experiment, the subjects would be randomly assigned to two different groups. Using your understanding of scientific method, what name would you use to describe each group, and what would you give to the members of each group to test your hypothesis?

* Treatment | Experimental group (1)
gets the vaccine (1)
* Control group (1)
gets a placebo (1).

(4 marks)

(e) List two variables that would need to be controlled in this experiment.

- Age of subjects
- exposure to same strain of virus
- other diseases
- other drugs used
- activity level of subjects. (any 2) 1 each.

(2 marks)

(f) What sort of immunity is being induced by a vaccine?

Active artificial

(1 mark)

(g) Describe three barriers present within the nasal cavity that will help to keep infection out of the body.

(i) Mucous membrane || stops virus sticking to cells

(ii) Protective antibodies || prevent virus adhering to cells damage/kill virus

(iii) Cilia || removal of organisms

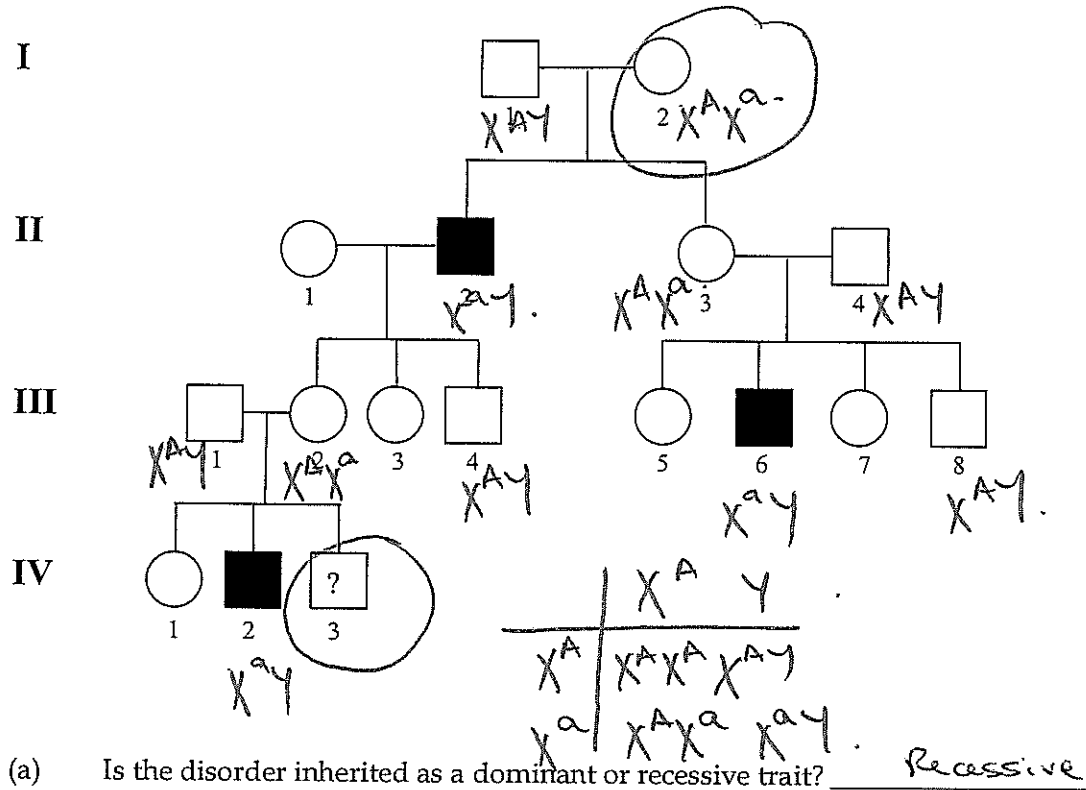
Passage of air/sneezing || removes infectious organisms

etc.

(3 marks)

QUESTION 44 (11 marks)

Question 46 relates to the pedigree shown below. This shows the inheritance, within a family, of a very rare disorder. Individual IV.3 is a newborn baby who has not yet been tested for the disorder.



(a) Is the disorder inherited as a dominant or recessive trait? Recessive

(1 mark)

(b) Explain how you arrived at your answer in (a).

Unaffected parents have affected children

trait skips a generation

(1 mark)

(c) Is the trait more likely to be autosomal or X-linked?

X-linked.

(1 mark)

QUESTION 44 (continued)

(d) Explain how you arrived at your answer in (c).

* No father to son transmission

* No affected ♀'s * only ♂'s affected

* show all genotypes

(1 mark)

(e) Using the letters 'A' and 'a' to represent dominant and recessive alleles, respectively, write the full genotype of individual I.2.

$X^A X^a$

(1 mark)

(f) What is the chance that the newborn baby (individual IV.3) has the disorder?

50% | 0.5 | $\frac{1}{2}$ | 1 in 2.

(1 mark)

(g) The ABO blood grouping system displays two phenomena in genetics.
Explain the following terms and give an example using the ABO system.

(i) Multiple alleles

(*) where 2 alleles / variations of the gene exists (1)

(*) eg. I^A, I^B, i (1)

(2 marks)

(ii) Co-dominance

(*) Effects of both alleles are apparent /

* expressed in the genotype (1)

(*) eg. Bl. gr. AB (1)

(2 marks)

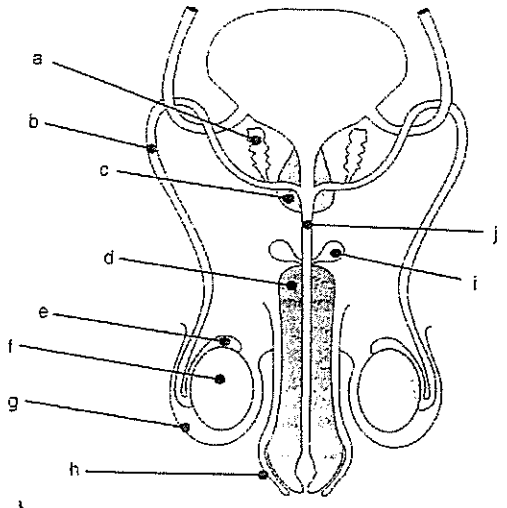
(h) Apart from the ABO system, name ONE other blood grouping system.

Rhesus | MN | PS | Kell | Lewis.

(1 mark)

QUESTION 45 (12 marks)

(a) Use the diagram below to identify structures **a – h.**



a Seminal vesicles

b vas deferens

c prostate

d erectile tissue of penis

e epididymis

f testes

g scrotum

h foreskin.

(8 marks)

(b) What is the function of structure **g**? scrotum.

allows testes to sit outside the body to allow for sperm production to take place at ≈ 3° below normal body temp.

(1 mark)

(c) Describe what occurs in a vasectomy and how this prevents pregnancy.

Vas deferens is cut + tied ∴ prevents sperm going from epididymis/testes to outside preventing pregnancy or semen with no sperm.

(2 marks)

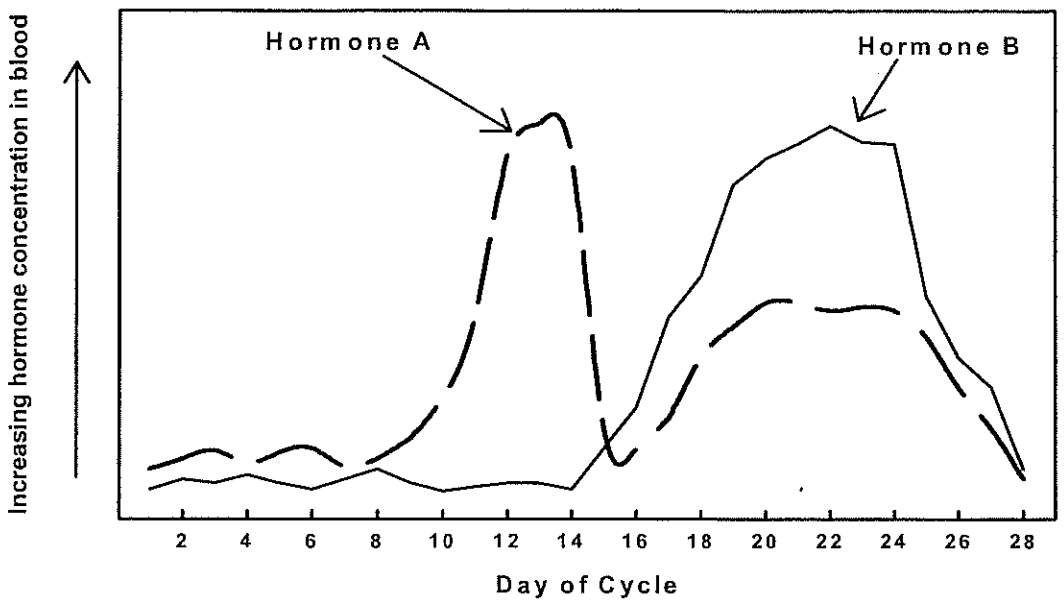
(d) Describe the role of structure **c.** prostate.

thin + milky alkaline fluid secreted which aids in sperm mobility + neutralises acidity in vagina.

(1 mark)

QUESTION 46 (9 marks)

The graph below shows the concentration of two steroid hormones, labelled Hormone A and Hormone B, in the blood of a human female over the course of a single 28-day menstrual cycle. Use this graph to answer the questions below.



(a) Identify hormone A. State the main effect of this hormone.

Oestrogen | oestradiol

(2 marks)

(b) Identify hormone B.

Progesterone

(1 mark)

(c) Over what 3-day period does the concentration of hormone A rise the most?

any 3 days between Days 9 → 13

(1 mark)

(d) What important event has occurred on about day 14?

Ovulation || release of egg || LH surge / release || oestrogen or Hormone A ↓

(1 mark)

QUESTION 46 (continued)

(e) Name the endocrine gland that secretes hormone B.

Corpus luteum / yellow body

(1 mark)

(f) What is the major hormonal stimulus for the rise in hormone B?

Luteinizing Hormone / LH.

(1 mark)

(g) In this particular woman, on what day does the concentration of hormone B reach its peak?

Day 22

(1mark)

(h) On what day does hormone B begin its major premenstrual decline?

Day 24 or 25

(1mark)

QUESTION 47 (10 marks)

The table below shows the percentage composition of certain materials in plasma and urine from a healthy individual.

Substance	Plasma	Urine
	%	%
Water	90-93	95.0
Proteins & fats	6.0	0.0
Glucose	0.1	0.0
Sodium	0.32	0.35
Potassium	0.02	0.15
Urea	0.03	2.0
Creatinine	0.001	0.075

QUESTION 47 (continued)

(a) Account for the following patterns between plasma and urine shown in the table by referring to nephron function and **WHERE** in the nephron these processes are taking place.

(i) The DECREASE in percentage composition for glucose.

Glucose is (actively) reabsorbed.

(primarily) in PCT

(2 marks)

(ii) The INCREASE in percentage composition for urea.

* due to mae reabsorption of H_2O (1)

* and little (or no) urea being reabsorbed / urea left in filtrate (1)

* any one of PCT / descending Loh | DCT | C. Duct. up to (2).

Max 3 mks. (3 marks)

(b) Explain why the percentage composition of proteins and fats in urine is zero.

* Molecules of protein too large (1) so cannot

* undergo (glomerular) filtration / to fit thru pores between glomerulus + Bowman's Capsule (1) (2 marks)

(c) The metabolic waste product, urea, is produced by the process of deamination. Describe WHERE and HOW this process occurs.

* Deamination takes place in liver (1)

* X-C proteins / a.a (1)

* are broken down / catabolised / metabolised / have their amine group removed (1)

(3 marks)

QUESTION 48 (4 marks)

Mean height (cm) of boys and girls according to age and origin

Origin of children	Boys aged 10	Boys aged 18	Girls aged 10	Girls aged 18
Japan, 1900	123	161	123	147
Japan 1954	131	166	131	153
Japanese-Americans 1957	136	169	137	156

Data adapted from Greulich, WW (1976).

The table above shows mean heights in centimetres for large groups of children aged 10 and 18 years, calculated from three sets of measurements. One set was taken in Japan in 1900, one in Japan in 1954 and one in children of Japanese origin living in North America in 1957. This last group of children were born in America to parents who had migrated from Japan.

(i) What is the difference in mean height between the Japanese-American girls at age 18 and those who were measured at the same age in Japan in 1900?

9 cm (inc. units) (1)

(ii) Which group of boys shows the greatest difference in height between ages 10 to 18?

1900 (Japan) (1)

(iii) What general trend is apparent for the children of immigrants compared with those born in Japan?

↑ height at both ages (1)
slower overall rate of growth

(iv) What is the most likely reason for this change in phenotype?

- ↑ nutrition in early childhood (1)
- better public health
- more exercise (any 1.)
- different diet
(gender effect)

QUESTION 49 (19 marks)

(a) Explain why an increased intake of each of the following is necessary during pregnancy. (Be specific!)

(i) Protein

Required for structural growth of new cells / enzymes.

(1 mark)

(ii) Calcium

Bone / Teeth growth + Blood Clotting.

(1 mark)

(iii) Iron

synthesis of Haemoglobin

(1 mark)

(iv) Folate

needed for normal RBC production
↓ risk of Spina bifida in foetus.

(1 mark)

(b) Describe 4 ways that HIV can be prevented from spreading from person to person.

1	use of condoms
2	don't share needles / utensils etc.
3	blood rule - cover up / bandaids.
4	Tested before having sex

(4 marks)

anything reasonable

check Blood / Donor products

(c) Complete the following table:

MOTOR DEVELOPMENT TYPE:	DESCRIBE THE PATTERN:
CEPHALOCAUDAL	head to foot.
PROXIMO DISTAL	Development outwards. Control of muscle/limbs close to the body and progressively towards the extremities until fine movement is obtained.
GROSS TO SPECIFIC	gross muscle group first then fine motor groups develop.

(3 marks)

(d) Give 4 advantages of breast feeding over bottle feeding for the baby:

1	antibodies received
2	balance of necessary minerals
3	right Temperature
4	milk easily digested.

less likely to develop obesity.

(4 marks)

(e) Explain some of the current treatments for infertility for the following:

TREATMENT	HOW IT WORKS	WHEN IT COULD BE USED
DONOR EGG or **EMBRYO**	Egg donated by another woman + mixed with partner's sperm.	When a women is unable to conceive using her own eggs.
GIFT	Eggs + sperm are mixed immediately after the eggs have been collected + the mixture injected into the fallpian tubes	. Variation of IVF . Inability to conceive but no apparent reason eg/ blockage in oviducts

(4 marks)

END OF SHORT ANSWER SECTION