THE UNIVERSITY OF WESTERN AUSTRALIA
Achieving International Excellence

SCHOOL OF ANATOMY & HUMAN BIOLOGY

SEMESTER 2, EXAMINATIONS 2008

ANHB2216
HUMAN REPRODUCTIVE BIOLOGY

FAMILY NAME: _____ GIVEN NAMES: _____

STUDENT ID: ☐☐☐☐☐☐☐☐ SIGNATURE: _____

This Paper Contains: 9 Pages
Time allowed: 2 hours 10 minutes

INSTRUCTIONS

1. Check that you have THREE items.
   (a) This question paper.
   (b) A booklet to answer the short answer questions and essay.
   (c) A sheet for MCQ answers.
2. Write your personal details on ALL of the 3 items.
3. ALL the items listed above must be handed in at the end of the examination.
4. This exam is in THREE sections.
   A. Multiple choice questions (questions 1 –25). Answer ALL questions. These should take about 40 minutes to complete and are worth 1/3 of the paper.
   B. Short answer questions (questions 26-35). Answer SIX questions. These should take about 40 minutes to complete and are worth 1/3 of the paper.
   C. Essay questions (questions 36-38). Answer ONE question. This should take about 40 minutes to complete and is worth 1/3 of the paper.
5. **Carefully read the instructions at the beginning of each section.**
6. This paper contributes 40% to your semester grade.

PLEASE NOTE

Examination candidates may only bring authorised materials into the examination room. If a supervisor finds, during the examination, that you have unauthorised material, in whatever form, in the vicinity of your desk or on your person, whether in the examination room or the toilets or en route to/from the toilets, the matter will be reported to the head of school and disciplinary action will normally be taken against you. This action may result in your being deprived of any credit for this examination or even, in some cases, for the whole unit. This will apply regardless of whether the material has been used at the time it is found.

Therefore, any candidate who has brought any unauthorised material whatsoever into the examination room should declare it to the supervisor immediately. Candidates who are uncertain whether any material is authorised should ask the supervisor for clarification.

PART A

Answer **ALL** of the questions (1-25) in this section.
It is recommended that you spend about **40 minutes** on this section.

Choose the best alternative (A, B, C, D or E) and mark your answers clearly on the answer sheet provided. Note: use only a soft lead pencil to write on the answer sheet. Make corrections with an eraser. Do not use white- out or other correcting fluid.

1 Which of the following is **NOT** a steroid hormone?

A Estradiol 17β
B 5αdihydrotestosterone (DHT)
C Cortisol
D *Prolactin
E Dehydroepiandrosterone (DHEA)

2 Which statement about hormone action is **INCORRECT?**

A *Binding of progesterone receptors activates second messenger systems
B Binding of steroids to carrier proteins protects them from metabolism by the liver
C FSH receptors are membrane bound
D Usually less than 10% of steroid hormone is free, biologically active hormone
E Continuous infusion of GnRH results in decreased secretion of LH and FSH from the anterior pituitary due to receptor down-regulation

3 Which statement about the hormonal control of the ovarian cycle **INCORRECT?**

A In the ovarian follicle the thecal cells produce testosterone which is aromatised to estradiol 17β by the granulosa cells
B Inhibin A enhances androgen output by the thecal cells
C The estradiol surge increases GnRH pulse frequency
D Estradiol increases the sensitivity of the anterior pituitary to GnRH
E *Progesterone enhances the positive feedback effects of estradiol on LH and FSH

4 Which statement about sex determination is **INCORRECT?**

A Female phenotypic differentiation is not dependent on an ovary to proceed
B *Fetal leydig cells secrete Mullerian inhibiting hormone
C Fibroblast growth factor 9 expression is essential for formation of seminiferous tubules
D A male infant with a deficiency in the enzyme 5α reductase would have testes and female external genitalia
E In the absence of Mullerian inhibiting hormone the Mullerian ducts (paramesonephric ducts) form the uterus, uterine tube and upper portion of the vagina

5 Which of the following statements about puberty are **CORRECT**?

a. At puberty the ovary contains both oogonia and primary oocytes
b. Immature gonads are unresponsive to LH/FSH
c. Leptin provides a positive stimulus to puberty
d. Nocturnal pulses of GnRH are characteristic of early puberty

A a and b only are correct
B a and c only are correct
C b and c only are correct
D b and d only are correct
E *c and d only are correct

6 Which of the following statements about spermatogenesis is **INCORRECT?**

A Spermatagonium have a diploid chromosome number
B Sertoli cells are the temporal and spacial organizers of spermatogenesis
C *Primary spermatocytes are the product of the first meiotic division
D Spermatids have a haploid chromosome number
E Spermiogenesis is the cytoplasmic remodelling of spermatids to form spermatozoa

7 Which statement about sperm transport in the female tract is **INCORRECT?**

A Around the time of ovulation, myometrial contractions preferentially direct sperm to the uterine tube adjacent to the dominant follicle
B *Sperm are guided to the oocyte by a decreasing temperature gradient from the isthmus (warmer) of the uterine tube to the ampulla (cooler)
C Sperm are guided to the oocyte by chemical signals from the cumulus oophorus cells
D Sperm exhibit chemoreceptors in their tail and midpiece that resemble receptors in the nasal mucosa
E Sperm are temporarily stored at the utero-tubal junction by binding to the mucosal epithelium

8 Which statement is **INCORRECT?** The syncytiotrophoblast of the human placenta….

A is multinucleated and in direct contact with maternal blood.
B is derived from the underlying cytotrophoblast.
C produces human chorionic gonadotrophin to rescue the corpus luteum in early pregnancy.
D has a microvillous border to increase surface area.
E *is the only cellular layer separating maternal and fetal blood.

9 Which statement about glucocorticoid hormones is **INCORRECT?**

A The placental glucocorticoid barrier limits passage of maternal cortisol to the fetus.
B Synthetic glucocorticoids are often given to pregnant women who threaten to deliver prematurely.
C *The fetal adrenal gland produces high quantities of cortisol from early in pregnancy.
D Glucocorticoids stimulate late maturation of the fetal lung and liver.
E Glucocorticoid excess during pregnancy can limit fetal growth.

10 Which statement about fetal growth is **INCORRECT?**

A The greatest amount of absolute fetal growth occurs in the third trimester.
B The second trimester is a period of rapid relative fetal growth.
C Full genetic potential for fetal growth is not reached due to maternal constraint.
D *Fetal growth hormone is the most potent hormonal stimulus for fetal growth.
E Insulin-like growth factor II from the placenta provides a major stimulus for fetal growth.

11 Which statement about abortion in Western Australia is **INCORRECT?**

A Abortions after 20 weeks gestations require the authorisation of two medical practitioners
B Abortion is legal if the pregnancy is causing serious danger to the woman's health
C Abortion is legal if the fetus has a malformation
D A women must be provided with the opportunity for counselling
E *Abortion for social reasons is limited to the first 12 weeks of gestation

12 Which statement about maternal respiratory physiology is **INCORRECT?** The decreased maternal arterial concentration of carbon dioxide (CO_2).....

A * is due to an increase in breathing rate
B is due to an increased sensitivity of the hypothalamus to carbon dioxide
C is due to a increase in tidal volume
D facilitates the transfer of oxygen to the fetus
E facilitates the removal of carbon dioxide from the fetus

13 Which statement is **CORRECT?** The initiating signal (trigger) for human labour is likely to be….

A a rise in cortisol secretion from the fetal adrenal
B a decline in progesterone production by the placenta
C *an increase in placental corticotrophin releasing hormone (CRH)
D a rise in human chorionic sommatomammotrophin (hCS)
E a decline in estrogen production by the placenta

14 Which statement about lactation is **INCORRECT?**

A Lactation has an immunological role and a nutritional role
B Onset of lactogenesis (milk secretion) is triggered by the decrease in progesterone and estrogen at parturition
C In most species the onset of lactogenesis occurs at the time of birth
D *Maintenance of milk secretion is dependent on stimulation by oxytocin
E The milk ejection reflex can be a conditioned response (eg to a babies cry)

15 Which statement about sexually transmitted infections is **INCORRECT?**

A Gonorrhoea and chlamydia can cause female infertility
B Human Papilloma Virus (genital warts virus) can cause cervical and other genital cancers
C Congenital syphilis can lead to birth defects
D *In W.A. the most common sexually transmitted infection is gonorrhoea
E Viral infections can be suppressed but not cured

16 Which statement about female reproductive aging is **INCORRECT?**

A Menopause is characterised by increased circulating levels of FSH
B Menopause is characterised by decreased follicular estrogen
C *Menopause is characterised by increased follicular inhibin levels
D Menopause is characterised by a decline in the number of ovarian follicles
E Menopause typically occurs between age 45 and 55

17 Which statements about reproduction in the aging male are **CORRECT?**

a. Androgen deficiency is the main cause of reduced sexual activity in older men
b. Testosterone levels decline by about 1% per year after the age of 50
c. Symptoms of androgen deficiency may include muscle loss and fat gain
d. Spermatogenesis declines abruptly after about 50 years of age

A a and b only are correct
B *b and c only are correct
C c and d only are correct
D a and c only are correct
E b and d only are correct

18 What is the **best** explanation of the increase in human population number, estimated to have occurred approximately 10,000 years ago?

A lower adult death rates due to settlement
B lower infant death rates due to settlement
C increased survivorship of infants due to settlement
D *increased birth rates due to shorter interbirth intervals
E low adult death rates due to lower disease levels

19 Which statement about fertility is **INCORRECT?**

A Oligospermia refers to a sperm count of less than <20 million sperm per mL
B Low body weight is associated with an increased frequency of anovulatory cycles
C Smoking causes DNA damage to sperm
D A "normal" semen sample can contain up to 85% sperm with abnormal morphology
E *Approximately 1 in 20 couples will experience fertility problems during their reproductive years

20 Which statement about infertility treatment is **INCORRECT?**

A Timed intercourse is a first line of treatment for couples with unexplained infertility
B *The chance of successful pregnancy with IVF in women aged >40 years, using their own oocytes, is about 25%
C Preimplanation genetic diagnosis has been legal in WA since June 2004
D Assisted hatching is believed to improve pregnancy rates for women of advanced maternal age
E The first successful live birth of an IVF baby was in 1978

21 Which statements are **CORRECT?** Nuva ring (vaginal ring) works by…..

a. Causing the cervical mucous to thicken
b. Blocking the uterine tubes
c. Irritating the lining of the uterus so it is inhospitable for embryonic and fetal development
d. Inhibiting the release of FSH and LH

A a and b only are correct
B b and c only are correct
C *a and d only are correct
D c and d only are correct
E all are correct

22 Which statement about reproductive cancers is **INCORRECT?**

A *Increased apoptosis and decreased proliferation is linked to tumour development
B Androgen ablation therapy is useful for treating cancers of the prostate
C Mutations in the BRCA1 and BRCA2 tumor suppressor genes increase the risk of breast cancer
D Most reproductive cancers involve cells of epithelial origin
E Tamoxifen is an estrogen antagonist used in breast cancer treatment

23 Which statement about fecundability **INCORRECT?**

A *In a typical sample of couples attempting pregnancy fecundability is about 0.5
B Fecundability is the probability of conceiving in a given month
C Lower fecundability is associated with an increased waiting time to conception
D Breast feeding reduces fecundability due to its effect on ovulation frequency
E Fecundability increases with increasing frequency of intercourse

24 Which statement about the effects of stress on reproduction is **INCORRECT?** According to the reproductive suppression model (RSM)….

A Older women should be less likely to suppress reproduction at times of acute stress than younger women
B *If a stressor is predictable it is less costly to suppress late reproductive events (eg fetal growth) than early reproductive events (eg ovulation)
C Reproduction should be suppressed if predicted future conditions are likely to be better than current conditions
D Females are more likely to suppress reproduction in times of acute stress than males
E Reproduction should be suppressed if eventual failure is likely

25 Which statement about the human pelvis is **INCORRECT?**

A *The sub-pubic angle is smaller in females than males
B The greater sciatic notch is wider in females compared to males
C Shape differences in the human male and female pelvis result from opposing selection pressure for large brains and efficient bipedal locomotion
D The anterior superior iliac spines are closer together in males than females
E The pelvic inlet is rounder in females and heart-shaped in males

PART B

SHORT-ANSWER QUESTIONS

Answer **SIX** of the ten questions (questions 26-35) in this part.

It is recommended that you spend about **40 minutes** on this part.

Write **BRIEF NOTES** on **SIX** of the following. You may draw diagrams where appropriate to illustrate your answer. Write your answers in the booklet provided.

26. Explain why continuous infusion of GnRH can be used as form of chemical castration.

27. Describe the changes in maternal glucose metabolism during pregnancy and its functional significance.

28. What is meant by the terms chromosomal sex, genetic sex and phenotypic sex. Briefly describe how each is related to the others.

29. Briefly describe the hormonal preparation of the endometrium that is required to facilitate implantation.

30. Discuss the functions of Sertoli cells in relation to spermatogenesis.

31. Give **two** pieces of evidence that menopause is NOT an example of natural senescence in a physiological system and explain logically why this evidence supports the hypothesis that menopause is an evolved characteristic in humans.

32. Scientifically define the terms embryo, fetus, miscarriage and stillbirth. Give two examples of ways that scientific or medical terminology may clash with how women view their pregnancy.

33. Briefly describe preimplantation genetic diagnosis (PGD) including an account of who uses it, what it is used for and any advantages/disadvantages it offers over other techniques.

34. Choose a reproductive cancer and briefly outline the role of hormones in the development of the cancer. How can manipulation of hormones be used to treat the cancer?

35. From listening to the Group Presentations write brief notes about **one** of the following (**do not** write on a topic related to your own group's presentation).

    a. What are environmental estrogens? How may they affect male reproductive health?
    b. Describe how nutrition may affect reproductive health of the male.
    c. Briefly outline the main argument/s presented by the "Reproduction for the Future group".
    d. Based on the arguments presented by the reproductive aging group, do you agree with the statement "It is Grandmother's hand that best rocks the cradle"? Given reasons for your answer.

PART C

MAJOR ESSAY

Answer **ONE** of the questions in this section (36 **OR** 37 **OR** 38).

It is recommended that you spend up to **40 minutes** on your answer. Write your answer in the booklet provided.

36. Monica carefully watches what she eats and runs 10 km 3 or 4 times a week; her BMI is 18. Monica and her partner want to start a family but Monica has not had a menstrual period for 6 months. The doctor tells Monica to increase her energy consumption or decrease her exercise load. Use an evolutionary perspective to explain what has happened to Monica and why the doctor's suggestion could help her achieve pregnancy.

OR

37. Discuss the key structural features the human placenta, including changes that occur from the first to the third trimester. Include in your discussion the impact that these changes have on placental transport and the fetus.

OR

38. Describe the development of the breasts from birth to lactation, and what happens after weaning. Discuss the benefits of breast feeding from the perspective of the infant, the mother and society.