Government of **Western Australia**
School Curriculum and Standards Authority

SAMPLE ASSESSMENT TASKS

HUMAN BIOLOGY
ATAR YEAR 11

Sample assessment task

Human Biology – ATAR Year 11

Task 3 – Unit 1

Assessment type: Science Inquiry

Conditions
Period allowed for completion of the task:

- Investigation planning completed and **submitted Week 3** (15 marks)
- Conducting investigation, using three class periods between weeks 5–7
- Reporting and writing up of investigation results completed and **submitted Week 8** (40 marks)

Task weighting
3.5% of the school mark for this pair of units

Investigation of cardiovascular health in teenagers

Plan and conduct an investigation to compare the cardiovascular health of active teenagers (involved in sport/aerobic exercise regularly) with inactive teenagers. Write a scientific report about your investigation, as described below.

1. **Plan the investigation** **(15 marks)**
   - Decide on the hypothesis, dependent and independent variables in your investigation.
   - What are the controlled variables?
   - Research and provide background information on cardiovascular health that relates to your hypothesis.
   - Decide upon the appropriate number of subjects and how many and what type of measurements will be made.
   - Describe in detail how you will conduct your investigation.
   - Write down the steps of your investigation in sequence.
   - Propose the way that you will record your data.
   - State how you will process the data to arrive at some conclusions.

2. **Conduct the investigation**
   - Set up times and places for the measurements to be taken with your subjects.
   - Carry out data collection from subjects.

3. **Process, evaluate and communicate findings** **(40 marks)**
   Write up your investigation as a scientific report including the following:
   - Introduction – include background information and hypothesis. (2 marks)
   - Materials and method – list materials, state how you collected your data, how you minimised the effect of uncontrolled variables, present raw data in an appropriate format. (4 marks)
   - Results – show processing of raw data, identify any outliers, and plot by hand any graphs to show results. (10 marks)
   - Analysis and evaluation – describe the trend and pattern in your data, state how your data relates to your hypothesis, use your knowledge and understanding to explain your results, comment on the reliability and accuracy of the data collected, comment on the reliability of your collection strategy, list two limitations in the data collection strategy that may have affected the accuracy of your data, list two improvements you could make to the data collection strategy. (20 marks)
   - Conclusion – summarise your findings and comment on the validity of the outcome of the investigation. (4 marks)

Marking key for sample assessment task 6 – Unit 1

Item	Possible mark
Planning Investigation—Notes on background material and preparation	**15**
Identifies hypothesis	1–2
Identifies dependent and independent variables and factors to be controlled or taken into account	1–2
Provides background information on cardiovascular health and relates it to the investigation	1–2
Proposes an appropriate range for, and number of values of, the independent variable and an appropriate number of measurements of the dependent variable	1
Describes in detail, a strategy for the data collection in a clear, logical manner	1–2
Sequences the steps in the data collection strategy in a clear, logical manner	1–2
Proposes an appropriate format for recording the raw data to be collected	1–2
States how the raw data will be processed in order to provide evidence to support or disprove hypothesis e.g. provide means, plotting graphically	1–2
Total	**/15**
Scientific report	**40**
Introduction (2) • Provides background information included in introduction • States hypothesis clearly	 1 1
Materials and method (4) • Lists all materials • Describes how data was collected and processed in a safe and ethical manner • States how the effects of uncontrolled variables and other factors were minimised during data collection • Records raw data in an appropriate format	 1 1 1 1
Results (10) • Carries out simple processing of raw data ▪ calculation of mean values ▪ recorded appropriate format • Identifies outliers in the raw data • Plots an appropriate graph/s of the processed data using correct conventions ▪ appropriate title stating independent and dependent variables ▪ correctly labelled axes ▪ axes labels with units ▪ correct type of graph ▪ correctly plotted graph	 1–3 1–2 1–5
Analysis and Evaluation (20) • Describes the trends and patterns in the processed data • Makes a valid statement about ▪ the trends and patterns using data collected ▪ and relates it to hypothesis • Explains data using scientific knowledge and understanding ▪ describes using scientific terminology relationship between exercise and cardiovascular fitness ▪ provides detail on aerobic capacity and efficiency of circulatory system with exercise • Comments on the reliability of the raw data collected • Comments on the accuracy of the raw data collected • Comments on the reliability of the data collection strategy • Lists at least two limitations in the data collection strategy that may have affected the accuracy or precision of the raw data collected • Suggests at least two improvements to the data collection strategy	 1–2 1–2 1–2 1–2 1–2 1–2 1–2 1–2 1–2 1–2

Conclusion (4) • Summarises results of the investigation • Comments on the validity of the outcome of the investigation	 1–2 1–2
Total	**/40**
Final total	**/55**

Sample assessment task

Human Biology – ATAR Year 11

Task 8 – Unit 1

Assessment type: Extended response

Conditions
Time for the task:

- Part 1: two lessons to research topic and complete notes
- Part 2: one lesson for in-class validation – extended response exam style question

Task weighting
4% of the school mark for this pair of units

Osteoporosis and osteoarthritis research assignment

Part 1: Research notes **(5 marks)**

Osteoporosis and osteoarthritis are both degenerative bone diseases that can cause disability and are usually associated with ageing. Increased understanding of the causes of these conditions has led to improved practices for management and prevention. Research:

- the causes and symptoms of osteoporosis and osteoarthritis
- the effect of osteoporosis and osteoarthritis on bone and/or joint structure
- the medical technologies that are currently available for the treatment of each of these diseases along with any risks or side effects.

*Note: all research should be based on Australian medical information

Part 2: In-class assessment **(37 marks)**

- You will be given specific examination style questions based on the topic you have researched.
- Notes will not be allowed for this task.

Part 2: In-class assessment **(37 marks)**

Osteoporosis and osteoarthritis are both degenerative bone diseases that can be associated with ageing.

(a) Distinguish between osteoporosis and osteoarthritis. (2 marks)

1. Osteoporosis is more common among women than men. In Australia 5.5% of women, compared to 1.2% of men, have osteoporosis.

   (a) Describe, in terms of bone structure, how osteoporosis develops and explain why women are more likely to be affected by osteoporosis than men. (10 marks)

   (b) List **three** risk factors for increased likelihood of being affected by osteoporosis and how it is diagnosed in Australia. (4 marks)

   (c) Describe **one** form of treatment and any associated risks or side effects. (10 marks)

2. In 2007–08 an estimated 7.6% of all Australians (1.6 million people) had osteoarthritis.

   (a) Describe the common symptoms of osteoarthritis and provide the main causes of osteoarthritis. (4 marks)

   (b) Describe the process of diagnosis for osteoarthritis and the most common treatment. (7 marks)

Marking key for sample assessment task 8 — Unit 1

Part 1: Research notes

Description	Mark
Causes and symptoms of osteoporosis	1
Causes and symptoms of osteoarthritis	1
Effect of osteoporosis and osteoarthritis on the bones/joints	1–2
Current medical technology used for treatment of osteoporosis and osteoarthritis	1
Total	**/5**

Part 2: In-class assessment

1. Distinguish between osteoporosis and osteoarthritis.

Description	Mark
Osteoarthritis = loss/wearing away of cartilage at joints	1
Osteoporosis = loss of calcium/bone density/weakening of bones	1
Total	**/2**

2. Osteoporosis is more common among women than men. In Australia 5.5% of women, compared to 1.2% of men, have osteoporosis.
   (a) Describe, in terms of bone structure, how osteoporosis develops and explain why women are more likely to be affected by osteoporosis than men.

Description	Mark
Bones lose minerals Bone breakdown/resorption occurs faster than new bone formation Bone density decreases Bones become more porous and fragile	1–4
Sex hormones oestrogen and testosterone help maintain bone formation	1
Men develop greater bone density than females during development	1
Oestrogen levels decrease rapidly during menopause which results in rapid increase in bone loss	1–2
Testosterone gradually decreases over time with age therefore increase in bone loss is gradual over time	1–2
Total	**/10**

   (b) List three risk factors for increased likelihood of being affected by osteoporosis and how it is diagnosed in Australia.

Description	Mark
Any of the following risk factors: • low calcium intake • low vitamin d levels • low hormone levels/women – early menopause/men – low testosterone • low levels of physical activity • smoking • excessive alcohol intake • high intake of corticosteroids	1–3
Any of the following: • bone density scan • dual-energy absorptiometry (DXA) scan	1
Total	**/4**

(c) Describe one form of treatment and any associated risks or side effects.

Description	Mark
Treatment for osteoporosis should include safe exercise program – including modified strength training and safe weight bearing	2
Treatment for osteoporosis should include fall prevention – including exercise to improve balance, trip proof home, wearing hip protector, wearing sturdy footwear	2
Treatment for osteoporosis should include a diet/supplements rich in calcium and vitamin D	2
Any one of the following medication treatments with associated risk two marks for treatment; two marks for risks (not all risks need to be included)	
Treatment Bisphosphonate – most commonly used for initial treatment, Bisphosphonates tablets taken regularly to help reduce bone breakdown **Risks/side effects** May cause stomach upset, ulcers and rarely cancer, pain in bones and joints and can cause jawbone decay/osteonecrosis (rarely)	1–4
Treatment Denosumab – 6 monthly injection works differently to bisphosphonate but has same results **Risks/side effects** Numbness/tingling in fingers, muscle cramps/aches, seizures, skin infection/itchy dry skin, back muscle or bone pain, joint pain of knees, hips and spine, high cholesterol, stomach pain/nausea	
Treatment Strontium renalate – sachet dissolved in water absorbed in similar way to calcium. Helps increase bone formation and decrease bone loss. For treatment of severe established osteoporosis **Risks/side effects** Increased risk of cardiovascular disease, seizure, loss of consciousness, very rare life threatening rashes toxic epidermal necrolysis (TEN), Stevens-Johnson syndrome (SJS) and severe hypersensitivity reactions (DRESS)	
Treatment Selective oestrogen modulators (SERMs) – SERMS mimic oestrogen to help reduce rate of bone loss. **Risks/side effects** Potential side effects include hot flushes and a slightly increased risk of deep vein thrombosis	
Treatment Hormone replacement therapy (HRT)/testosterone therapy – artificial supplementation of sex hormones to reduce rate of bone loss **Risks/side effects** Breakthrough bleeding, breast tenderness, bloating, nausea. Small chance of increased risk of cardiovascular disease/stroke/deep vein thrombosis/endometrial cancer	
Treatment Parathyroid hormone – daily injections of PTH, regulates the amount of calcium, phosphorus and magnesium. Helps increase bone density. For severe cases of osteoporosis **Risks/side effects** Nausea, leg cramps, dizziness	
Total	**/10**

3. In 2007–08 an estimated 7.6% of all Australians (1.6 million people) had osteoarthritis.

   (a) Describe the common symptoms of osteoarthritis and provide the main causes of osteoarthritis.

Description	Mark
Common symptoms Pain and stiffness in joints	2
Common causes Previous joint injuries, overweight, occupations requiring repetitive use of joints	2
Total	**/4**

   (b) Describe the process of diagnosis for osteoarthritis and the most common treatment.

Description	Mark
Diagnosis formed through presence of symptoms and physical examination	2
Plus at least one of the following: x-rays may show narrowing/disfiguring of joint but are not conclusive blood test used to rule out other forms of arthritis	1
Treatment usually includes: • a form of pain relief such as paracetamol, • non-steroidal anti-inflammatory drugs (NSAIDs) • gentle exercise program • weight loss program if cause is from being overweight • joint replacement surgery if no other treatments are effective for pain management	1–4
Total	**/7**

Sample assessment task

Human Biology – ATAR Year 11

Task 17 – Unit 2

Assessment type: test

Conditions
Time for the task: 60 minutes

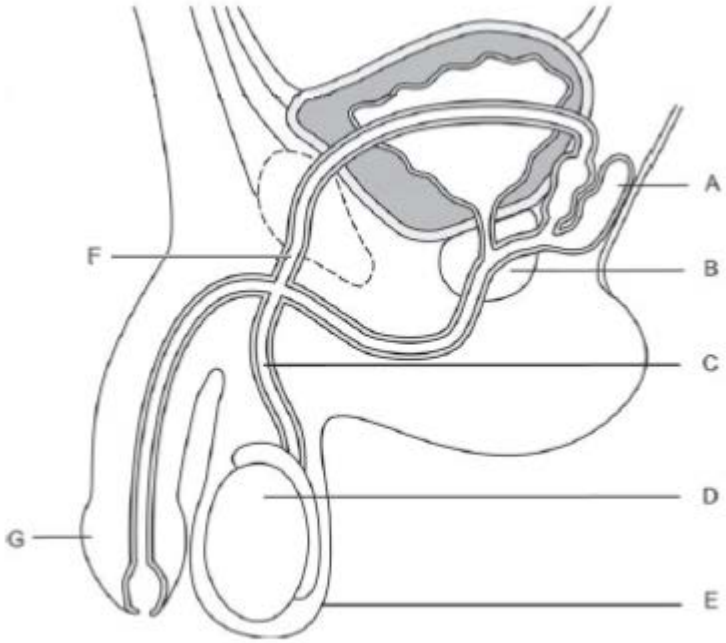
Task weighting
3% of the school mark for this pair of units

Reproduction and inheritance test

Part A: Multiple-choice **(15 marks)**

This section has 15 questions. Answer all questions on the multiple-choice answer sheet provided.

Questions 1 and 2 refer to the diagram below



1. The structures shown in the diagram that add fluid to the sperm to form semen are

   (a) A and C.
   (b) A and B.
   (c) B and C.
   (d) A and F.

2. Part F is the

   (a) vas deferens.
   (b) bladder.
   (c) prostate gland.
   (d) urethra.

3. Which of the following is **NOT** correct regarding spermatogenesis?

   (a) it begins before birth then ceases until after puberty
   (b) it occurs continually after puberty
   (c) the process takes about 72 days
   (d) one spermatogonium results in four viable spermatozoa

4. Follicle stimulating hormone (FSH) stimulates the

   (a) development of the corpus luteum.
   (b) production of progesterone.
   (c) production and development of a mature ovum, in the female, and the production of sperm in the seminiferous tubules, in the male.
   (d) vascularisation and glandurisation of the endometrium, resulting in it becoming thickened.

5. Progesterone secretion decreases sharply near the end of the menstrual cycle because

   (a) pregnancy results.
   (b) ovulation occurs.
   (c) a Graafian follicle develops.
   (d) the corpus luteum degenerates.

6. The greatest chance for an ovum to be fertilised, is having sexual intercourse

   (a) at the beginning of the menstrual flow.
   (b) at the end of the menstrual flow.
   (c) at the end of the menstrual cycle.
   (d) two weeks after menstruation starts.

7. Which one of the following tissue pairs develops from the same germ layer in a developing embryo?

   (a) bone tissue and the epithelium of the digestive tract
   (b) muscle and lung tissue
   (c) brain tissue and the epidermis of the skin
   (d) liver and nerve tissue

8. During childbirth, there are a number of key events:

   i. dilation of the cervix
   ii. crowning
   iii. delivery of the placenta
   iv. breaking of the waters
   v. contractions of the uterus
   vi. secretion of oxytocin
   vii. delivery of the baby

Using the above, the normal sequence of events is

   (a) vi, i, v, ii, iv, iii and vii
   (b) vi, v, i, iv, ii, vii and iii
   (c) i, ii, iv, vi, v, vii, and iii
   (d) v, vi, i, ii, iv, vii and iii

9. The placenta is the organ that allows for

   (a) mixing of maternal and foetal blood.
   (b) foetal blood gives off oxygen to maternal blood.
   (c) maternal blood receives nutrients.
   (d) foetal blood receives nutrients.

10. A woman who has heavy scaring to her uterus and has had several miscarriages in the last few years wants to have a baby. Which reproductive technology would be best suited to her?

   (a) artificial insemination
   (b) donor embryo
   (c) in vitro fertilisation (IVF)
   (d) surrogacy

11. Gonorrhoea and chlamydia are both sexually transmitted infections caused by

    (a) bacteria.
    (b) viruses.
    (c) fungi.
    (d) parasites.

12. Which of the following methods of contraception operates largely by preventing implantation rather than preventing fertilisation?

    (a) diaphragm
    (b) intra-uterine device
    (c) the oral contraceptive pill
    (d) condom

13. The transmission of sexually transmitted infections such as AIDS, syphilis and gonorrhoea can be limited by

    (a) oral contraceptive pill.
    (b) spermicide.
    (c) condoms.
    (d) intra-uterine devices.

14. A test that can be done during pregnancy to check for foetal abnormalities such as Down's syndrome, using a thin needle to extract fluid from the amniotic sac, is

    (a) an ultrasound.
    (b) amniocentesis.
    (c) genetic profiling.
    (d) chorionic villus sampling.

15. A man is unsure of his parentage to a new born baby. What test can be done to determine his parentage with a high amount of certainty?

    (a) blood test
    (b) urine test
    (c) amniocentesis
    (d) DNA profiling

Part B: Short answer **(51 marks)**

This section has three questions. Answer all questions in the spaces provided.

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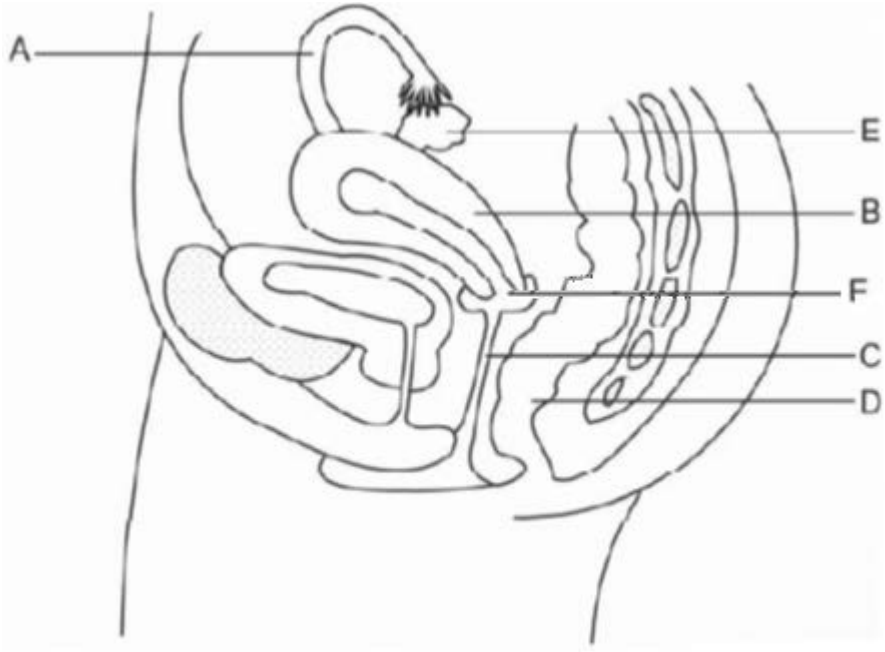
16. Cystic Fibrosis (CF) is an autosomal recessive disorder. A couple with a history of CF in their families undergo genetic counselling before trying to conceive a baby.

    (a) It is found that the man is a carrier for CF and the woman is homozygous normal. Predict the possible genotypes and phenotypes of their future children. (5 marks)

    (b) The genetic counsellor drew a pedigree to show the couple how CF has been inherited in their families. In the space provided, construct the pedigree diagram the counsellor would have drawn. Include:
    - three labelled generations
    - the couple's parents
    - the couple and their siblings. The man has an older sister; his sister was affected with CF. The woman is the oldest child, with a younger sister and an even younger brother who are unaffected
    - the prediction of three future children, who are all boys. (8 marks)

17. Use the following diagram of the female reproductive system to answer (a) and (b).



(a) Label the following structures: (2 marks)

B: _____

E: _____

(b) State the function for the following structures: (2 marks)

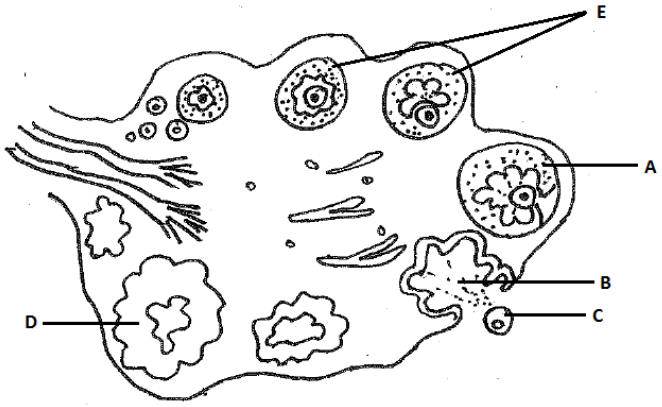
A: _____

_____

F: _____

_____

Use the diagram below to answer questions (c) and (d).



(c) Identify the structures: (4 marks)

A: _____

B: _____

C: _____

D: _____

(d) Describe the changes that occur in the ovary during the ovarian cycle. (7 marks)

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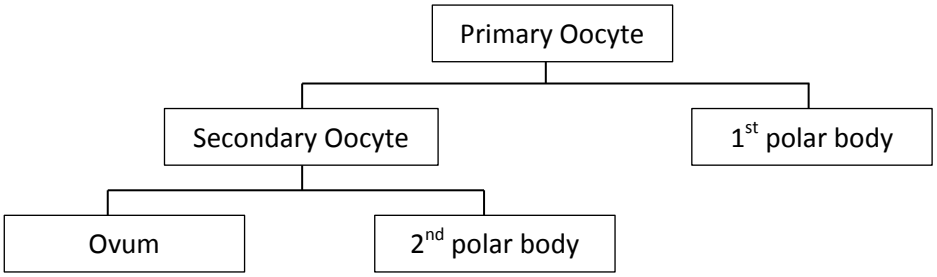
(e) Relate the changes occurring in the ovarian cycle to changes occurring in the uterus during the same time. (10 marks)

18. The following diagram shows some of the stages involved in the formation of human ova.



(a) How many chromosomes would you find in: (3 marks)

Primary oocyte	
Secondary oocyte	
Zygote (fertilised ovum)	

(b) State **two** important differences between the formation or characteristics of spermatozoa and ova.

(4 marks)

Difference	Spermatozoa	Ova
One		
Two		

(c) How does the process of meiosis produce genetic variation in sperm? (2 marks)

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(d) Describe how a vasectomy works as a contraceptive method. (2 marks)

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(e) Is it possible for a man who has had a vasectomy to pass on the sexually transmitted infection HIV to his partner? Explain your answer. (2 marks)

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END OF TEST

Marking key for sample assessment task 17 — Unit 2

Reproduction and inheritance test

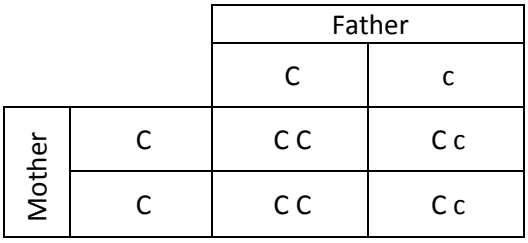
Part A: Multiple-choice

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

Part B: Short answer

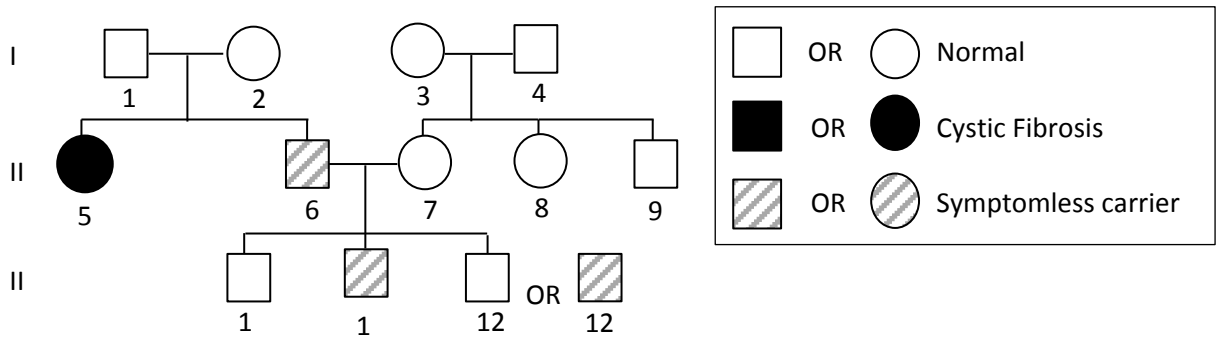
16. Cystic Fibrosis (CF) is an autosomal recessive disorder. A couple with a history of CF in their families undergo genetic counselling before trying to conceive a baby.

    (a) It is found that the man is a carrier for CF and the woman is homozygous normal. Predict the possible genotypes and phenotypes of their future children.

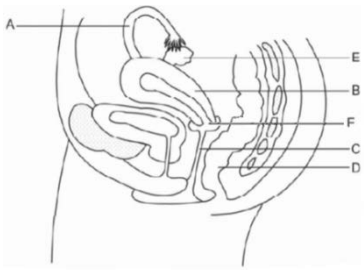
Description	Mark
	
Punnett square: Father's genes – heterozygous Mother's genes – homozygous	1–2
Key: C – normal gene c – gene for cystic fibrosis	1
Phenotype: 100% of children are normal	1
Genotype: 50% of children homozygous normal; 50% of children heterozygous normal/carriers	1
Total	**/5**

(b) The genetic counsellor drew a pedigree to show the couple how CF has been inherited in their families. In the space provided, construct the pedigree diagram the counsellor would have drawn. Include:

- three labelled generations
- the couple's parents
- the couple and their siblings. The man has an older sister; his sister was affected with CF. The woman is the oldest child, with a younger sister and an even younger brother who are unaffected
- the prediction of three future children, who are all boys.

Description	Mark
	
key for pedigree	1
couple's parents included in generation I	1
couple and their siblings included in generation II	1
man's older sister with CF	1
man as a carrier of CF	1
woman and siblings all normal	1
possible offspring all boys	1
50% of offspring carriers of CF	1
Total	**/8**

17. Use the following diagram of the female reproductive system to answer the following questions.



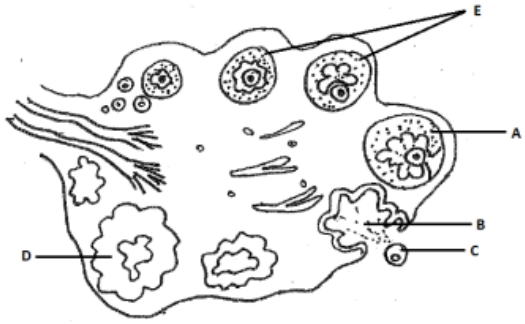
(a) Label the following structures:

Description	Mark
B: Uterus	1
E: Ovary	1
Total	**/2**

(b) State the function for the following structures:

Description	Mark
A: carry ova from fallopian tube to uterus	1
F: any of the following • direct sperm into uterus • allow menstrual blood flow from uterus	1
Total	**/2**

Below is a diagram of a section through an ovary



(c) Identify the structures:

Description	Mark
A: Graafian follicle or mature ovarian follicle	1
B: ruptured follicle	1
C: ova	1
D: corpus luteum	1
Total	**/4**

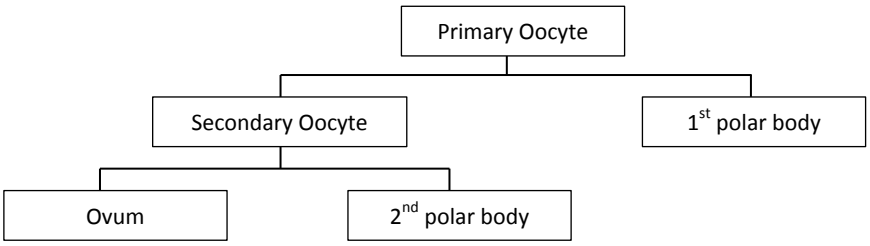
(d) Describe the changes that occur in the ovary during the ovarian cycle.

Description	Mark
secondary follicle starts to develop	1
Graafian follicle/mature follicle formed	1
mature follicle burst releasing ova/ovulation	1
ruptured follicle collapses and forms corpus luteum	1
hormones released to assist development of uterine wall	1
corpus luteum reaches maximum development if fertilisation doesn't occur corpus luteum degenerates	1
if fertilisation occurs corpus luteum continues to develop and ovarian cycle ceases during pregnancy	1
Total	**/7**

(e) Relate the changes occurring in the ovarian cycle to changes occurring in the uterus during the same time.

Description		Mark
Ovarian cycle	**Uterus changes**	
developing follicle	end of menstruation, beginning of thickening of uterus	1–2
Graafian/mature follicle development	continued endometrium thickening and softening, increase in blood vessels and mucous secreting glands	1–2
ovulation	endometrium continues to thicken and glands secrete watery fluid	1–2
development of corpus luteum	maintenance of thickened endometrial lining	1–2
degeneration of corpus luteum	endometrial lining/uterus lining, broken down capillaries, mucous secretions and cell debris fall away from uterus menstruation begins	1–2
	Total	**/10**

18. The following diagram shows some of the stages involved in the formation of human ova.



(a) How many chromosomes would you find in:

Description		Marks
Primary oocyte	46	1
Secondary oocyte	23	1
Zygote (fertilised ovum)	46	1
	Total	**/3**

(b) State **two** important differences between the formation or characteristics of spermatozoa and ova.

Description	Marks
Any two of the following from each category	1–2
Spermatozoa • four sperm produced • even distribution of cytoplasm • short life span/survival • produced in testis • small in size • motile/has tail • completes both mitotic and meiotic division at formation • produced at puberty onwards	

Ova • one ova produced • receives majority of cytoplasm • longer life span/survival • larger size • not motile/no tail • completes second division at fertilisation • produced before birth	1–2
Total	**/4**

(c) How does the process of meiosis produce genetic variation in sperm?

Description	Marks
independent assortment – each sperm receives only one of each of the homologous pairs of chromosomes	1
crossing over occurring during meiosis	1
Total	**/2**

(d) Describe how a vasectomy works as a contraceptive method.

Description	Marks
vas deferens is cut so no longer a complete/continuous tube	1
sperm prevented from being able to combine with semen in ejaculation	1
Total	**/2**

(e) Is it possible for a man who has had a vasectomy to pass on the sexually transmitted infection HIV to his partner? Explain your answer.

Description	Marks
yes	1
virus contained in body fluid body fluid/semen passed on through ejaculation	1
Total	**/2**

ACKNOWLEDGEMENTS

Sample assessment Task 8

Part 2

Questions 2–3 Data source: Australian Bureau of Statistics. (2011). *4843.0.55.001—Arthritis and osteoporosis in Australia: A snapshot, 2007–08* www.abs.gov.au/ausstats/abs@.nsf/Lookup/4843.0.55.001main+features32007-08
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Sample assessment Task 17

Questions 1–2 Image adapted from: Cull, P. (Ed.). (1989). *The sourcebook of medical illustration*. Park Ridge, NJ: Parthenon. Retrieved May, 2014, from www.cehd.umn.edu/phys/imagebank/Reproductive/default.html (male reproductive system).

Question 17 Image adapted from: [Female reproductive system lateral]. (2005). Retrieved May, 2014, from http://commons.wikimedia.org/wiki/File:Female_reproductive_system_lateral.png
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Question 17(c)–(e) Image adapted from: Lawson, R. (2007). [Ovarian cycle]. Retrieved May, 2014, from http://commons.wikimedia.org/wiki/File:Anatomy_and_physiology_of_animals_Ovarian_cycle_showing_from_top_left_clockwise.jpg
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