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PYMBLE LADIES' COLLEGE

YEAR 10 SCIENCE EXAMINATION SEMESTER II, 2004

QUESTION BOOK

TIME ALLOWED: 1½ HOURS

DIRECTIONS TO CANDIDATES:

Attempt ALL questions.

THIS PAPER IS IN THREE SECTIONS:

SECTION A	Questions 1-20	Multiple Choice Questions.	20 marks
SECTION B	Questions 21-30	Short Response Questions.	45 marks
SECTION C	Questions 31-33	School Certificate Focus Questions	15 marks

ALL answers to be written in the Answer Book provided.

SHOW ALL YOUR WORKING FOR CALCULATED ANSWERS

SECTION A

Questions 1-20 Multiple Choice (1 mark each)

For questions 1-20, choose the best of the four possible answers and indicate your choice by placing a CROSS (×) in the appropriate space on the grid in the Answer Book provided.

1. In the formation of gametes (sex cells), the parent cell undergoes a process called

A. mitosis

B. meiosis

C. replication

D. fertilization

2. Chromosomes are present in

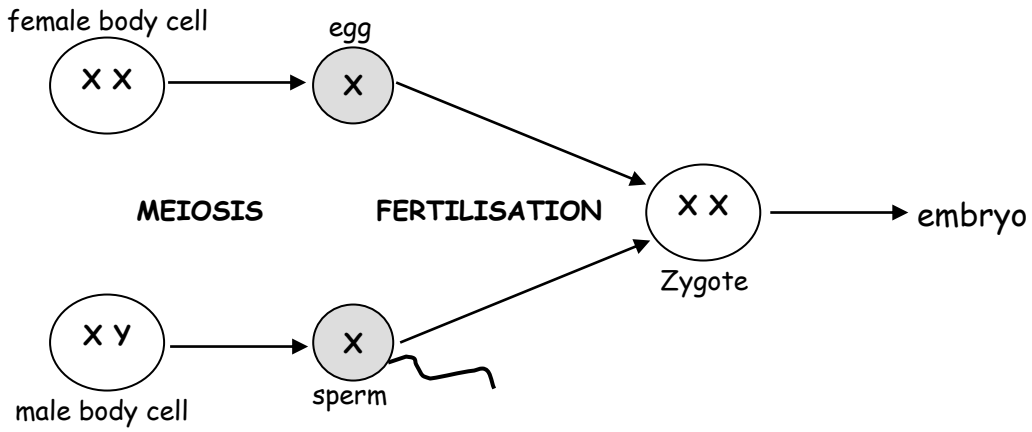
A. the nucleus of the cell.

B. egg and sperm cells only.

C. the chloroplasts of the cell.

D. fertilized egg cells only.

3. Refer to the diagram below:



The sex of the offspring is determined when the

A. egg is formed.

B. mitosis occurs.

C. zygote is formed.

D. embryo is 16 weeks old.

4. In a species of grasshopper, there are 24 chromosomes in each body cell. The number of chromosomes in a gamete (sex cell) of these grasshoppers would be:

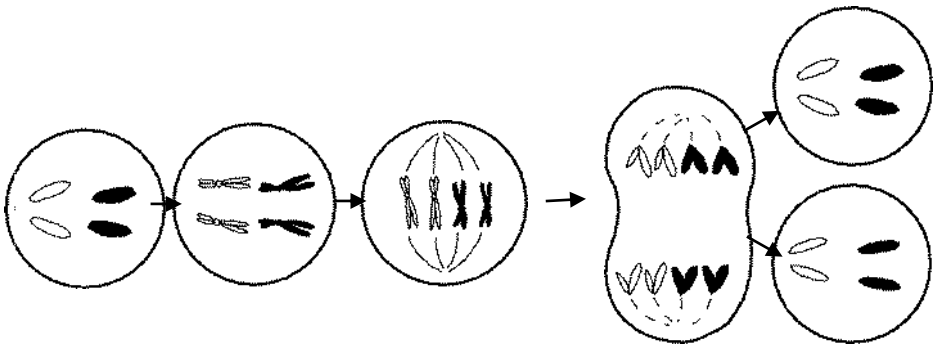
A. 6

B. 12

C. 24

D. 48

5. Refer to the diagram below which shows one type of cell division.



As a result of the type of cell division illustrated:

A. different gametes are produced.

B. identical body cells are produced.

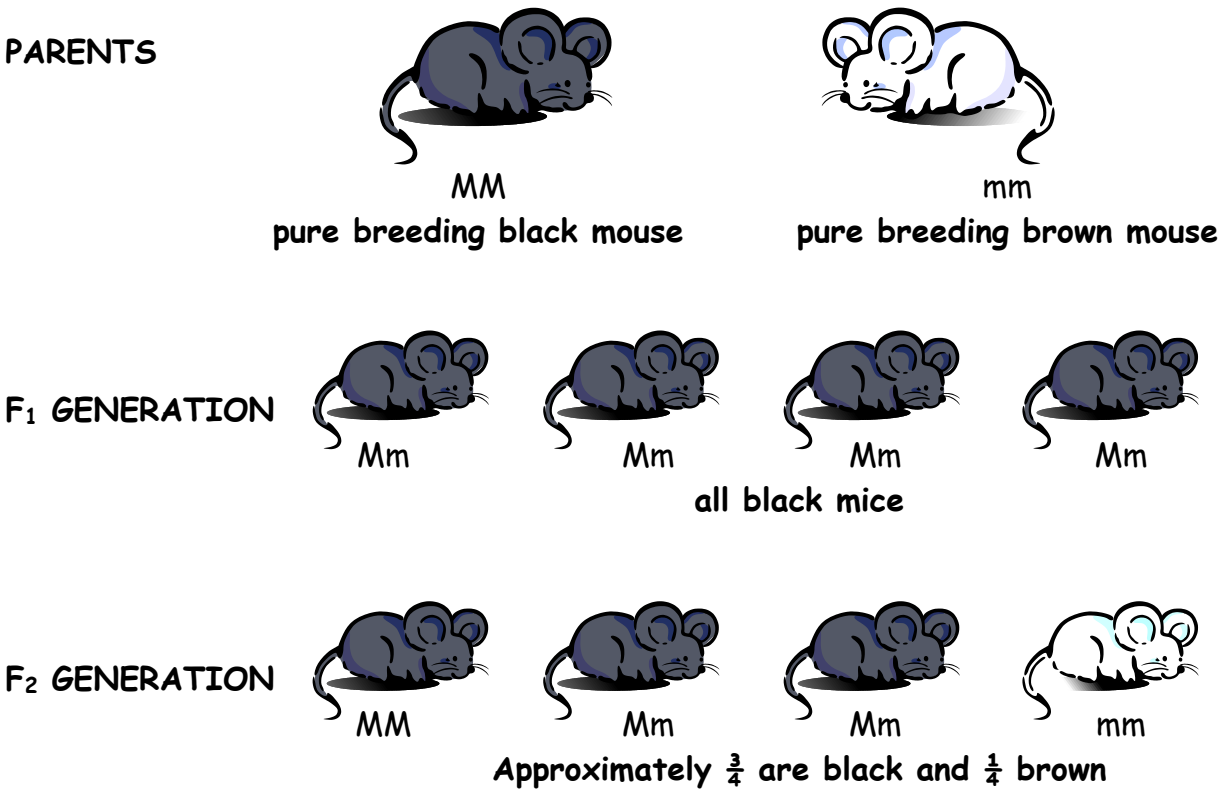
C. the number of chromosomes in each cell is doubled.

D. the number of chromosomes in each cell is halved.

The next 3 questions refer to the following information:

When a pure-breeding black mouse is mated with a pure-breeding brown mouse, all their offspring are black. These offspring are called the first filial (F_1) generation. If these F_1 generation black mice are mated amongst themselves, their offspring, the F_2 generation, will probably include both black and brown mice.

The expected ratio of black to brown mice in the F_2 generation is 3:1. The figure below summarizes the information just given. The letter-pairs *MM, Mm and mm* represent gene combinations which determine fur colour, where *M* is the gene for black fur and *m* the gene for brown fur.



6. The gene for black fur is an example of:

A. a dominant gene.

B. a sex-linked gene.

C. a recessive gene.

D. a heterozygous gene.

7. Of the mice in the F_1 generation

A. none carry the gene for brown fur.

B. about one-quarter carry the gene for brown fur.

C. half of them carry the gene for brown fur.

D. all of them carry the gene for brown fur.

8. Of the F_2 generation the expected proportion of mice which are pure-breeding (homozygous) for fur colour are:

A. 2/4

B. 1/4

C. 3/4

D. none

9. Which organism did the Austrian monk, Gregor Mendel use in his experiments involving genetics?

A. fruit flies

B. fire flies

C. snapdragons

D. garden peas

10. One strand of DNA contains the following sequence of bases:

G G A C T T T A C

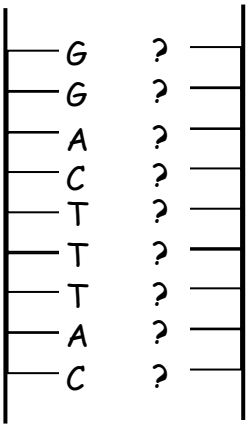
What would be the sequence of bases on the complementary strand of DNA?

A. G G A C T T T A C

B. C A T T T C A G G

C. C C T G A A A T G

D. G T A A A G T C C



11. Petroleum is an example of a fossil fuel. Which of the following is a correct statement about petroleum?

A. Petroleum is a mixture of organic compounds

B. Petroleum is a compound

C. Petroleum is a renewable resource

D. Petroleum is a polymer

12. A wide range of chemical compounds is produced from petroleum. Which of the following is **NOT**?

A. pharmaceuticals

B. cosmetics

C. detergents

D. biomass

13. Polymers form during a process known as polymerisation. During this process:

A. the long chain parts of soap molecules are attracted to grease

B. monomers are linked together to form long chains

C. fossil fuels are burned to release energy

D. petroleum is refined for use in industry

14. The gas formed when an acid is added to a metal is

A. carbon dioxide

B. hydrogen

C. nitrogen

D. oxygen

15. Thermosetting plastics differ from thermoplastics in that

A. thermosetting plastics are biodegradable but thermoplastics are not

B. thermoplastic plastics are biodegradable but thermosetting plastics are not

C. thermoplastic plastics soften when heated but thermosetting plastics do not

D. thermosetting plastics soften when heated but thermoplastics do not

16. Butane is the fossil fuel used in cigarette lighters. Which of the following is the word equation for the complete combustion of butane?

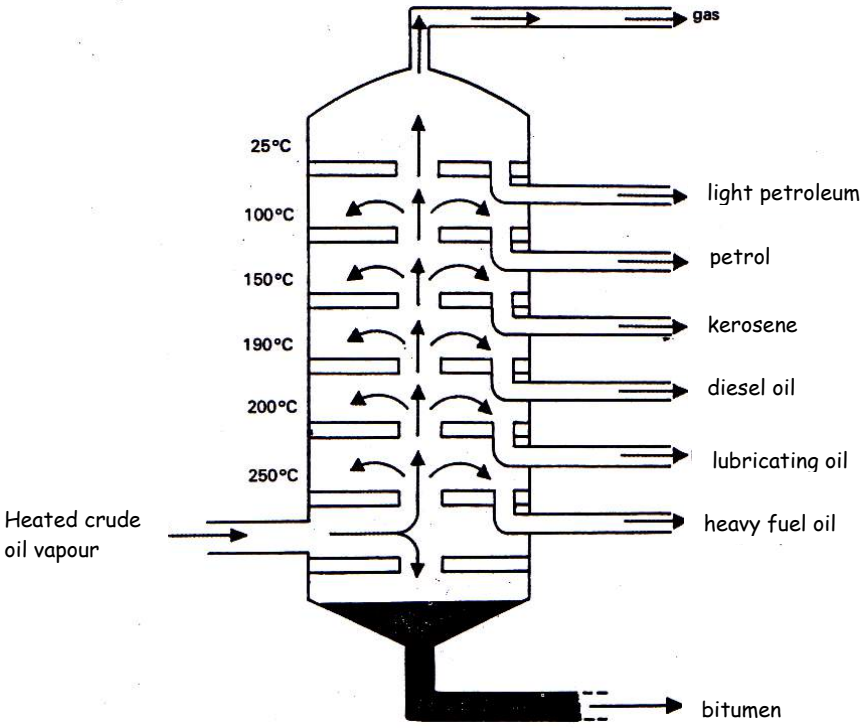
A. butane + oxygen → carbon dioxide + water + heat

B. butane + oxygen → butanoxide + heat

C. butane → ethanol + carbon dioxide + heat

D. butane + oxygen → carbon monoxide + carbon + heat

17. The diagram below shows a fractionating column used to separate crude oil into useful hydrocarbon compounds:



Which of the hydrocarbon products listed below would have the smallest molecule?

A. petrol

B. kerosene

C. diesel oil

D. lubricating oil

18. The table below gives the properties of four commonly used polymers in our society.

POLYMER	PROPERTIES
W	Soluble in water, non-conductor or electricity
X	Tough, waterproof; non-conductor of electricity
Y	Resistant to many chemicals; hard & brittle; waterproof
Z	Heat, sound and electrical insulator; shock absorbing; lightweight; waterproof

According to the information on the table, which of these polymers would be **most** suitable for packaging fragile (breakable) items?

A. Polymer W

B. Polymer X

C. Polymer Y

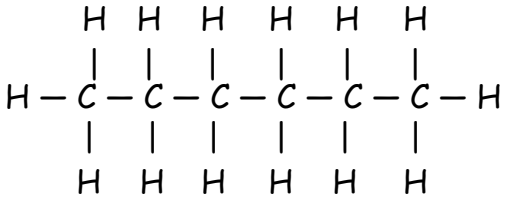
D. Polymer Z

19. The table below shows four hydrocarbons derived from petroleum with their melting points and boiling points.

Which hydrocarbon is a **liquid** fuel?

Hydrocarbon	Number of Carbon Atoms	Melting Point (°C)	Boiling Point (°C)
A	1	-182	-164
B	4	-138	-1
C	7	-95	69
D	17	42	302

20. What is the name of the hydrocarbon that has the following structural formula?



A. hexane

B. butane

C. ethane

D. methane

SECTION B

Short Response Questions 21-30

Attempt ALL questions

Show all necessary working in questions involving calculations.

21. The development of an entire organism is greatly influenced by the genes inherited from both parents and by the environment of the developing organism.

a) Identify two environmental factors that could cause a difference in phenotype between two genetically identical plants.

(2 marks)

b) Outline two ways in which a human adult with the gene for heart disease can influence his/her chances of developing the disease.

(1 mark)

22. The reproduction of unicellular organisms such as amoeba is relatively simple compared to the reproductive processes in multicellular organisms such as dogs.

a) Name the process by which a single celled organism reproduces.

(1 mark)

b) Explain why one cell from a multicellular organism (eg. a human) could not survive by itself out of the body.

(2 marks)

23. The inheritance of haemophilia in European Royal families is shown below.

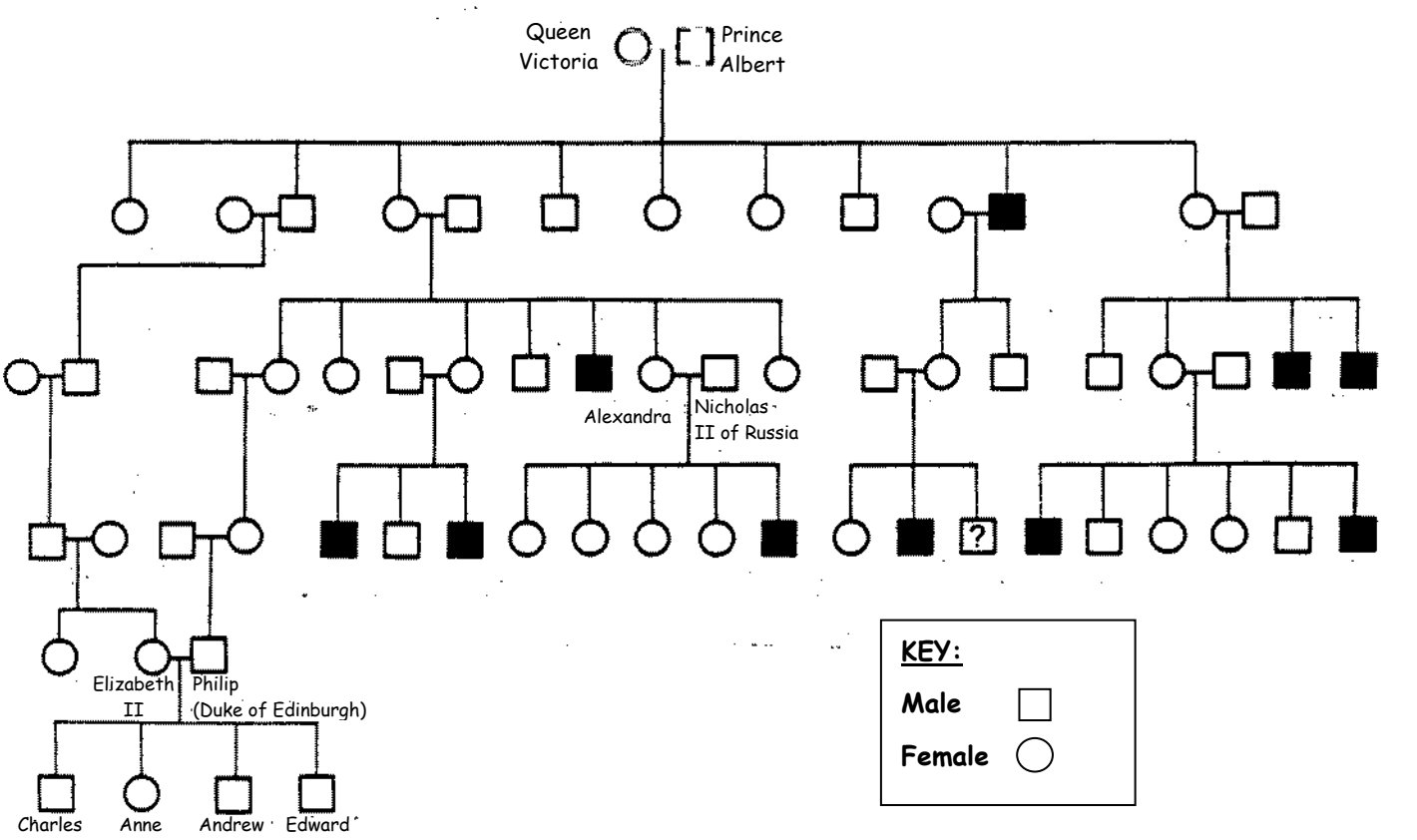


Figure: Inheritance of haemophilia in European families. The pedigree is of interest both because of the number of haemophiliacs, and because it shows how the present Queen of England is related to her husband. Black squares indicate a sufferer of haemophilia.

Use the following symbols to answer this question:

X^H	chromosome with the normal gene
X^h	chromosome with the haemophilia gene
Y	chromosome that does not carry the gene

a) Haemophilia is a disease in which blood fails to clot and is an example of a recessive sex linked disease. Outline what is meant by a sex linked disease. **(1 mark)**

b) Alexandra and Nicolas II of Russia married and had 5 children.
(i) What are the genotypes of Nicholas and Alexandra?

(1 mark)

(ii) Use a Punnet square (or genetic diagram) to calculate the **theoretical** proportion of genotypes in their offspring.

(2 marks)

(iii) What percentage of these offspring would be expected to be carriers of haemophilia?

(1 mark)

c) Give an example of another genetically inherited disease.

(1 mark)

24.

CANCER CLUE TO TWINS' SKINS

Moles and freckles, long thought to be a result of over-exposure to the sun, are genetic traits according to new research. Identical twins, who have the same genes are more likely to have similar number of moles and freckles than non-identical twins.

Knowing that the number of moles is a risk in skin cancer, isolating and studying the gene that governs it may help scientists to understand the cancer better. This could be the first step to finding a treatment and perhaps a cure for melanoma. It would involve using techniques of **genetic engineering**.

a) Skin cancer can be caused by gene mutations in skin cells. Define the term mutation?

(1 mark)

b) Outline two different genetic engineering techniques.

(2 marks)

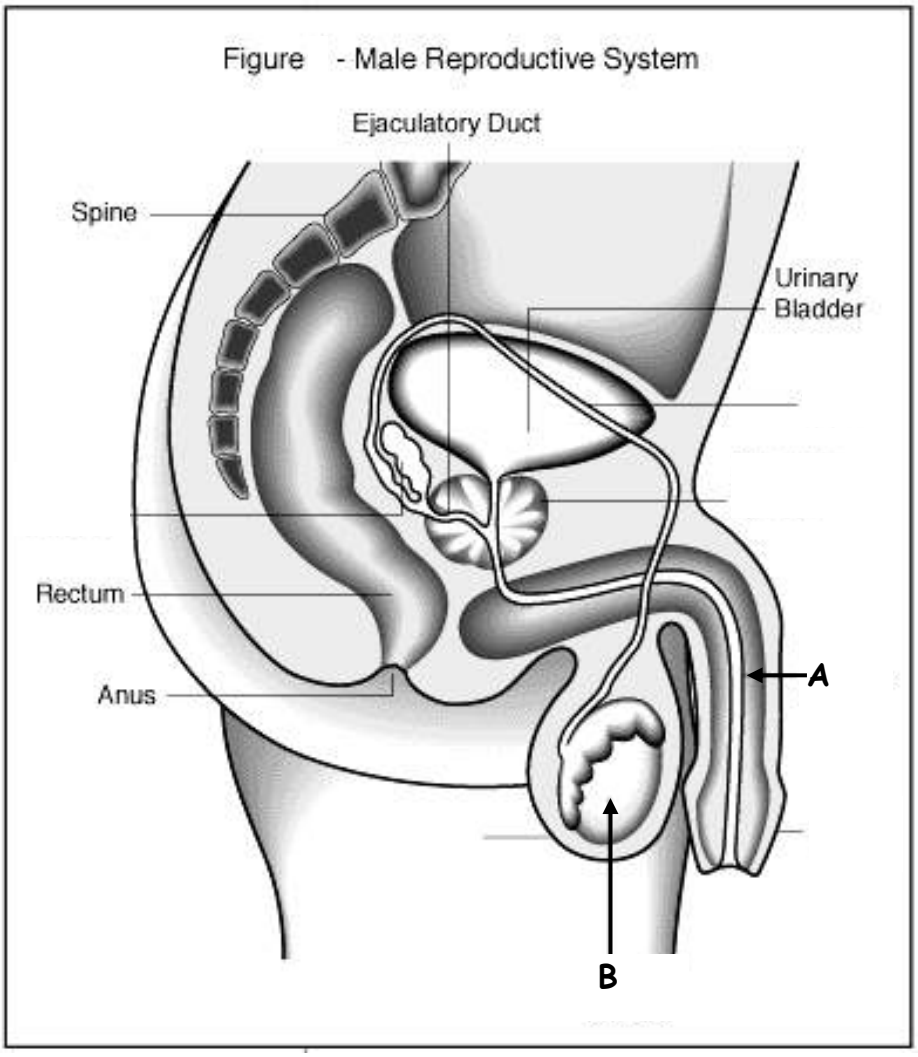
c) Describe one way in which genetic engineering has made a positive contribution to society.

(1 mark)

25.

a) Identify the structures labelled **A** and **B** on the following diagram of the male reproductive system.

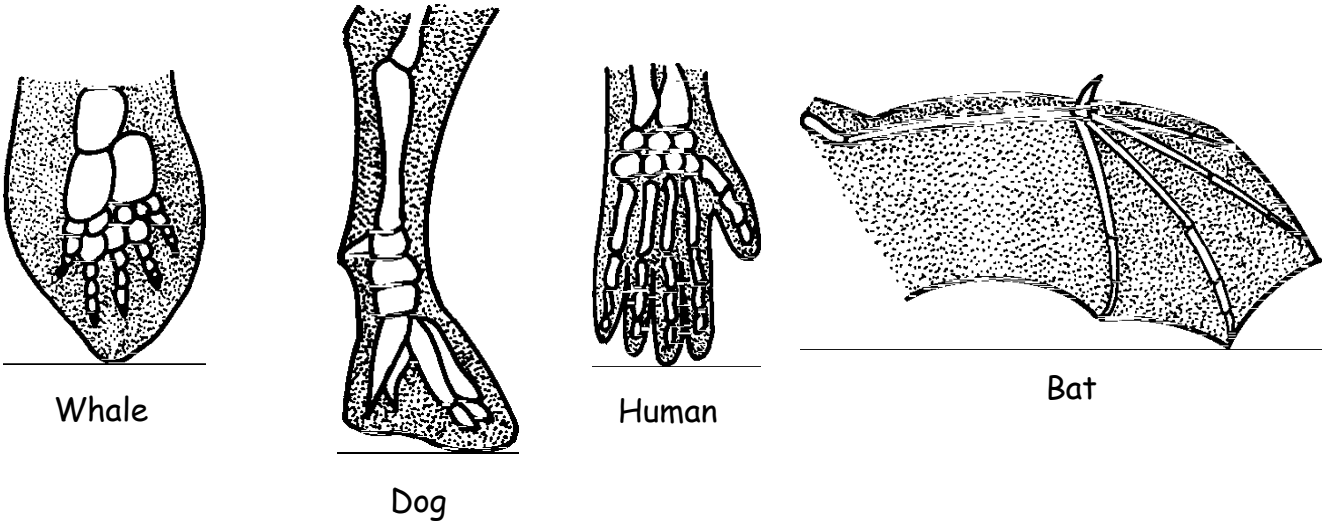
(1 mark)



b) Complete the table on the answer sheet which summarises the function of various parts of the female reproductive system.

(3 marks)

26. Refer to the diagrams below which illustrate the structure of the forelimb of several vertebrate animals. (not drawn to scale)



a) Identify one similarity between the bone structure of the whale and the bat forelimb bones.

(1 mark)

b) Identify one difference between the bone structure of the whale and the bat forelimb bones.

(1 mark)

c) State how the similarity in the structure of all the limbs shown above provides evidence for evolution.

(1 mark)

27. The increased (enhanced) Greenhouse Effect and its potential impact on global warming is a major issue affecting the world community today.

a) Identify the major gas pollutant responsible for the increased Greenhouse Effect.

(1 mark)

b) Describe how the Greenhouse Effect operates. You may wish to use a diagram to illustrate your answer.

(3 marks)

c) Outline <u>two</u> ways in which modern society could minimise the global warming problem that results from the increased Greenhouse Effect.

(2 marks)

28. Increasing levels of some gases in the atmosphere lead to a problem known as **acid rain**. The consequences of acid rain are devastating and widespread.

In the natural environment, waterways become too acidic for aquatic organisms to survive, leaf damage occurs, preventing photosynthesis and plant roots are unable to extract vital minerals from the soil.

a) Outline how acid rain is formed.

(2 marks)

b) Describe one effect of acid rain on the man-made (built) environment.

(2 marks)

29. During your Science course this year you completed a first hand investigation (experiment) in which you compared the energy released by the burning of ethanol (methylated spirits) with that released by the burning of other fuels such as paraffin oil and butane.

The table below summarises one set of possible results from this experiment:

FUEL TESTED	MASS USED (g)	TEMPERATURE CHANGE (°C)	ENERGY ABSORBED BY 100g OF WATER (J)
Ethanol	0.2	18	100 x 4.18 x 18 = **7524J**
Paraffin	0.3	21	100 x 4.18 x 21 = **8778J**
Butane	0.25	15	100 x 4.18 x 15 = **6270J**

a) Draw a labelled diagram of the equipment you used to carry out this experiment.

(2 marks)

b) Clearly identify all measurements that were made during the experiment.

(2 marks)

c) Use the data in the table above to calculate and identify the most efficient fuel tested

(2 marks)

30. Complete ONE of the following:

(I) Discuss the advantages and disadvantages of using ethanol from biomass as a fuel.

(2 marks)

OR

(II) Describe the manufacture and use of one major product produced from petroleum.

(2 marks)

OR

(III) Describe the process by which soap removes grease stains from clothing.

(2 marks)

SECTION C

School Certificate Focus Questions 31-33

Attempt ALL questions

31. The Atomic Theory is a unifying scientific theory describing the structure of the atom and the behaviour of its components.

a) What does the mass number of an atom refer to? **(1 mark)**

b) A sodium atom has a mass number of 23 and an atomic number of 11. Draw an electron shell diagram of the atom, indicating the number and position of protons, electrons and neutrons. **(2 marks)**

c) Define radioactive decay. **(1 mark)**

d) What kind of particle is ejected by the nucleus in beta decay? **(1 mark)**

e) Describe how radiation can be used to check the thickness of metal sheets. You may wish to use a diagram in your answer. **(2 marks)**

32. Waves are carriers of energy. They can be *mechanical* or *electromagnetic*.

a) Identify which of the above types of wave best describes light? **(1 mark)**

b) Can sound travel through a vacuum? Explain your answer **(2 marks)**

c) Complete the diagram (in the Answer Booklet) to describe the reflection of light. **(1 marks)**

d) Explain why a red object appears red in natural (white) light. **(2 marks)**

33. Complete the table (in the Answer Book) to summarise the advantages and disadvantages of the two energy resources, wind power and coal power. **(2 marks)**

END OF PAPER