

Cikgu Ghanapathi

SCIENCE SPM PAPER 2
(1511/2)

ANSWERING TECHNIQUE



SPM SCIENCE PAPER 2 FORMAT

No	Item	Paper 2 (1511/2)
1	Type of instrument	Subjective test
2	Type of item	Subjective item: <ul style="list-style-type: none">• Section A: Structured questions• Section B: Structured questions• Section C: Open response item and limited response item
3	Number of questions	<ul style="list-style-type: none">• Section A: 4 questions (answer all) - 20 marks• Section B: 5 questions (answer all) – 30 marks• Section C: 3 questions (answer Question 10 and either Question 11 or Question 12)
4	Total marks	70
5	Time	2 hours 30 minutes
6	Construct requirement	<ul style="list-style-type: none">• Knowledge: 20 marks• Understanding: 14 marks• Scientific skills: 30• Application: 6 marks

SPM SCIENCE PAPER 2 FORMAT

No	Item	Paper 2 (1511/2)
7	Level of difficulty <ul style="list-style-type: none">• Low - L• Moderate - M• High - H	L: M: H = 5: 3: 2
8	Extra instrument	Scientific calculator

SECTION A ANSWERING TECHNIQUE

- Construct tested is **science process skills**.
- There are 11 science process skills tested:
 - (i) Observing
 - (ii) Classifying
 - (iii) Measuring and using numbers
 - (iv) Inferring
 - (v) Predicting
 - (vi) Communicating
 - (vii) Using space-time relationship



SECTION A ANSWERING TECHNIQUE

- (viii) Interpreting data
- (ix) Defining operationally
- (x) Identifying variables
- (xi) Hypothesising




SECTION A ANSWERING TECHNIQUE

- Format to write hypothesis:

The **higher** the manipulated variable,
the **higher/ lower** the responding variable.

or

 As the manipulated variable **increases**,
the responding variable **increases/**
decreases.

or

The hypothesis can be a **scientific theory**.




SECTION A ANSWERING TECHNIQUE

Examples: Plants need complete nutrients
for healthy growth

Antibiotic prevents the growth of
bacteria

Acid can coagulate latex while
alkali can prevent latex from
coagulating



SECTION A ANSWERING TECHNIQUE

- Format to write aim:

To **investigate/ study** the relationship between the manipulated variable and responding variable.

or

To **investigate/ study** the effect of manipulated variable on the responding variable.

SECTION A ANSWERING TECHNIQUE

- Format to list the variables:

Parameter + Object

Examples: **Volume** of **gas**

pH value of **solution**

Intensity of **light**

- For variables with the parameter 'Type', the variables can be stated by listing the the **types** instead.

SECTION A ANSWERING TECHNIQUE

Examples:

- (i) Type of substance/ Ammonium chloride and sodium hydroxide
- (ii) Type of culture solution/ Complete culture solution, culture solution without nitrogen and culture solution without phosphorus

SECTION A ANSWERING TECHNIQUE

- Variables can be identified from:
 - (i) Question
 - (ii) Diagram
 - (iii) Table
 - (iv) Graph



SECTION A ANSWERING TECHNIQUE

- Format to write operational definition:

..... is a that

What you want to define

Use a suitable word
such as substance/ process

causes/ shows/ produces

Observation from the
experiment

SECTION A ANSWERING TECHNIQUE

Examples:

- (i) Antibiotic is a substance that produces a clear area on the nutrient agar surface that contains bacteria
- (iv) Calorific value is the value shown by the rise of temperature of water
- (v) Photosynthesis is a process that releases oxygen gas in the presence of light

SECTION A ANSWERING TECHNIQUE

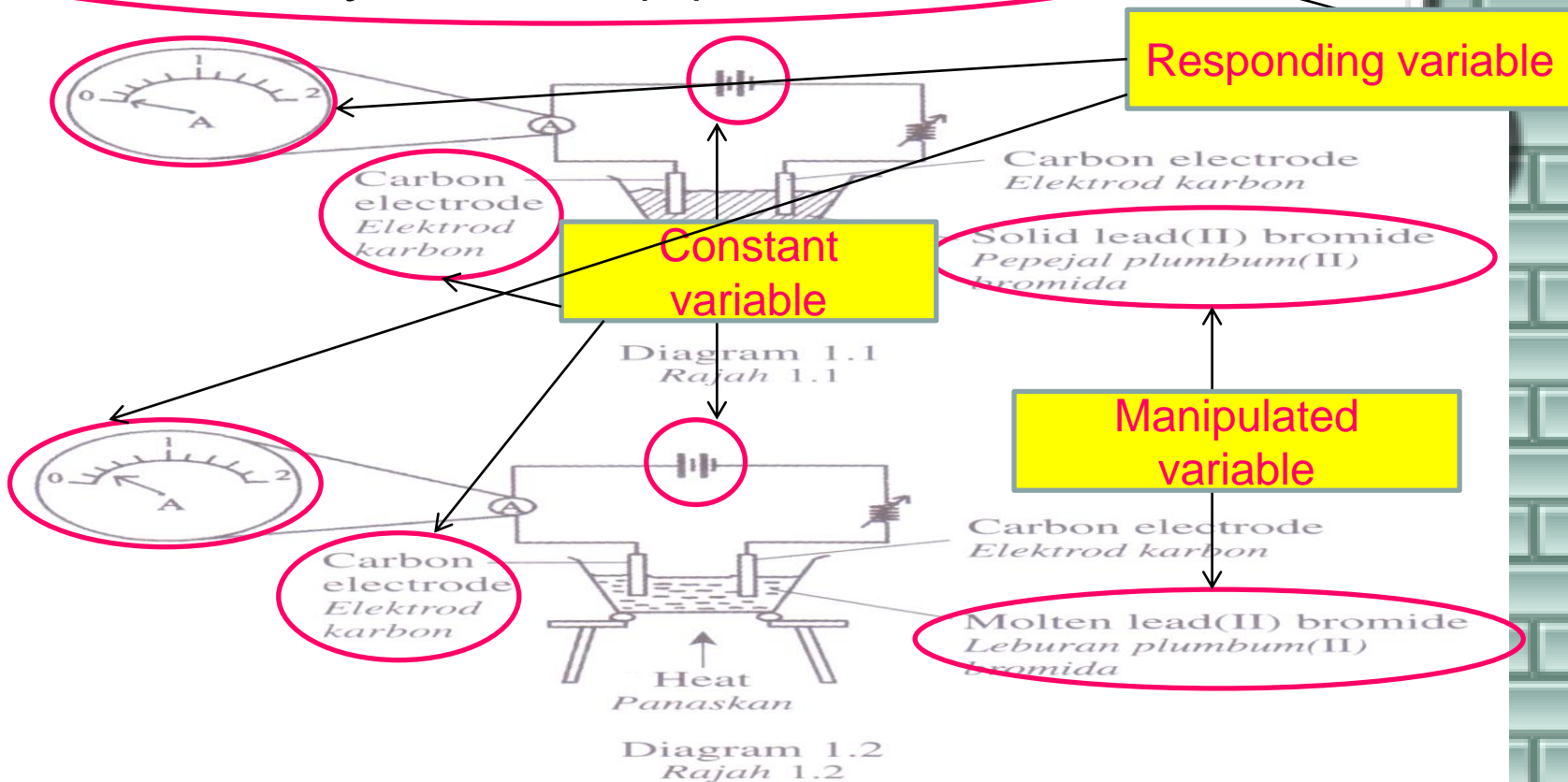
- Observation is made by finding **differences** or **changes**.

Examples:

- (i) Plant growth in complete culture solution is **taller/ bigger/ healthier** than the plant growth in culture solution without phosphorus
- (ii) The iron nail **rusts**

SECTION A ANSWERING TECHNIQUE

1. Diagram 1.1 and Diagram 1.2 show an experiment to study the electrical conductivity of lead(II) bromide.



SECTION A ANSWERING TECHNIQUE

Question

(a) (i) Based on Diagram 1.2, what is your observation on the needle of the ammeter?

Answer: The needle of the ammeter
deflects

(ii) What is the reading of the ammeter in
Diagram 1.2?

Answer: 0.4 A

SECTION A ANSWERING TECHNIQUE

(b) State the variables in this experiment.

(i) Manipulated variable

Answer: The state of lead(II) bromide

(ii) Responding variable

Answer: Electrical conductivity of lead (II) bromide/ The reading of the ammeter

SECTION A ANSWERING TECHNIQUE

(c) State **one** inference for this experiment.

Answer: Solid lead(II) bromide cannot conduct electricity and molten lead (II) bromide can conduct electricity



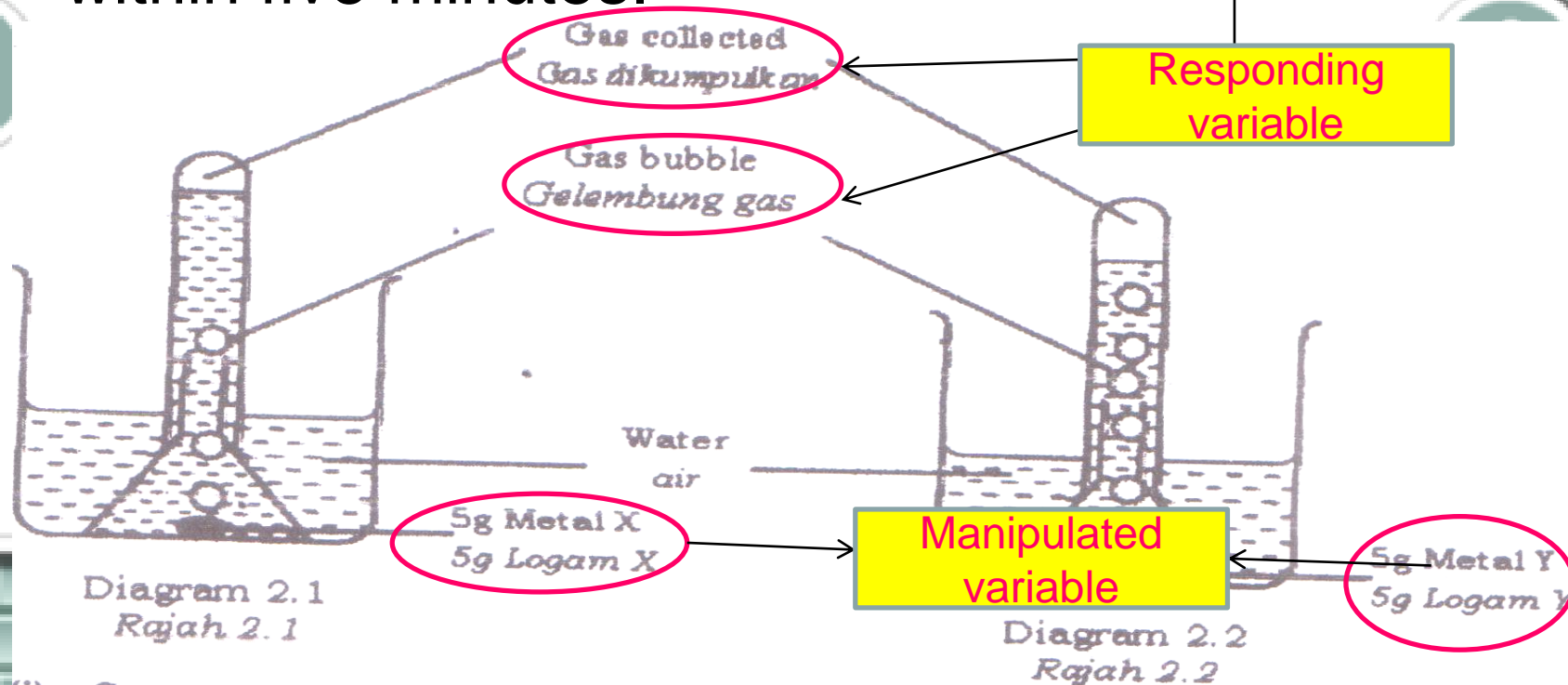
SECTION A ANSWERING TECHNIQUE

(d) Lead(II) bromide is an ionic compound.
State the operational definition of an ionic compound.

Answer: Ionic compound is a substance that causes the deflection of the needle of the ammeter in the molten state.

SECTION A ANSWERING TECHNIQUE

2. Diagram 2.1 and Diagram 2.2 show an experiment to study the reactivity of metal X and metal Y with water. Gas is collected within five minutes.



SECTION A ANSWERING TECHNIQUE

Question

(a) (i) State **one** observation from this experiment.

Answer: The number of gas bubbles released in Diagram 2.2 is more than the gas bubbles released in Diagram 2.1/



SECTION A ANSWERING TECHNIQUE

Volume of gas collected in Diagram 2.2 is more than the volume of gas collected in Diagram 2.1

(ii) Based on the experiment, mark (✓) the metal which is more reactive in Table 2.

Metal X	Metal Y
	✓

SECTION A ANSWERING TECHNIQUE

(b) State the variables in this experiment.

(i) Manipulated variable

Answer: Type of metal

(ii) Responding variable

Answer: Reactivity of metal/
Number of gas bubbles released/
Volume of gas released

SECTION A ANSWERING TECHNIQUE

(c) State the operational definition of reactivity of metal.

Answer: Reactivity of metal is a process that shows a number of gas bubbles released when a metal reacts with water/ Reactivity of metal is a process that causes a volume of gas released when a metal reacts with water



SECTION A ANSWERING TECHNIQUE

3. Table 4 shows the result of an experiment to study the growth of mucor on a bread. The experiment is carried out for five days at 37°C .

Constant variable

Responding variable

Time/ Day	Number of mucor colonies
0	0
1	1
2	3
3	5
4	6
5	6

Manipulated variable

SECTION A ANSWERING TECHNIQUE

(a) State one hypothesis that can be made for this experiment.

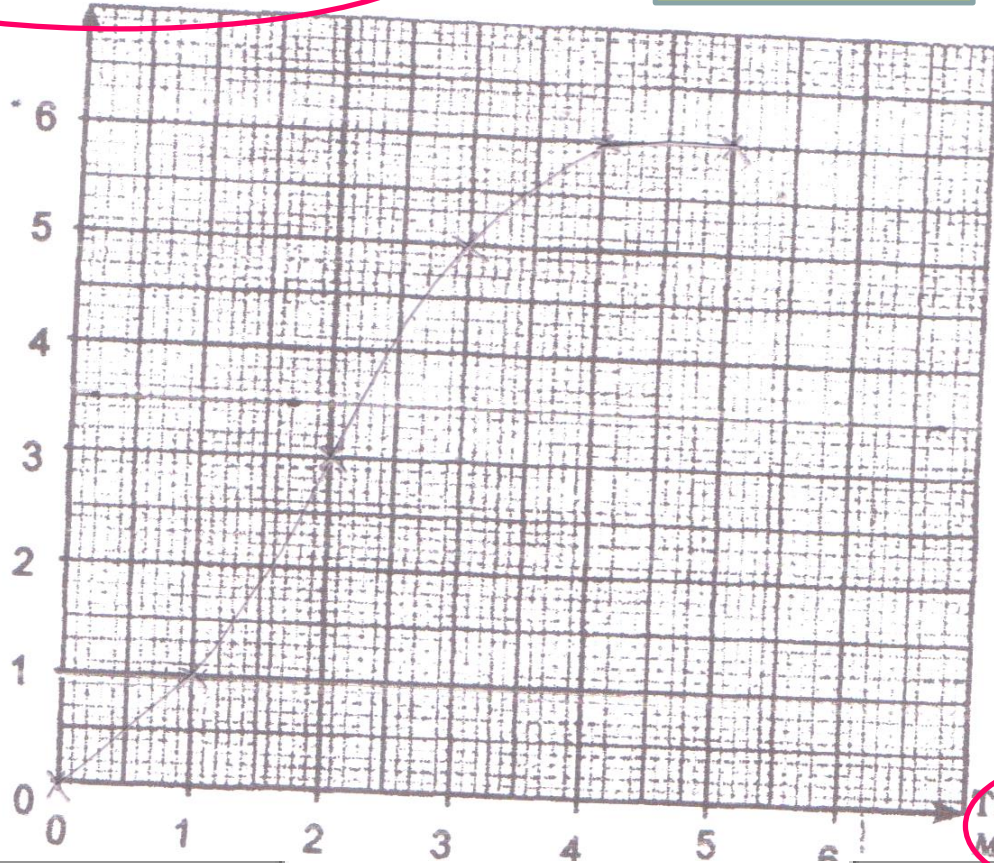
Answer: As the time increases, the number of mucor colonies increases

(b) Using data in Table 4, draw a graph of the number of mucor colonies against time.

SECTION A ANSWERING TECHNIQUE

The number of mucor colonies
Bilangan koloni mukor

Responding variable



Manipulated variable

Time/Day
Masa/Hari

SECTION A ANSWERING TECHNIQUE

(c) What is the relationship between the number of mucor colonies and time?

Answer: As the time increases, the number of mucor colonies increases.

(d) Predict the number of mucor colonies produced on the 6th day.

Answer: 6

Note: To predict, extend the graph from day 5 to day 6 using a pencil and erase the extrapolated part later.

SECTION A ANSWERING TECHNIQUE

4. Diagram 2.1 shows an experiment to study the formation of an image by a concave lens.

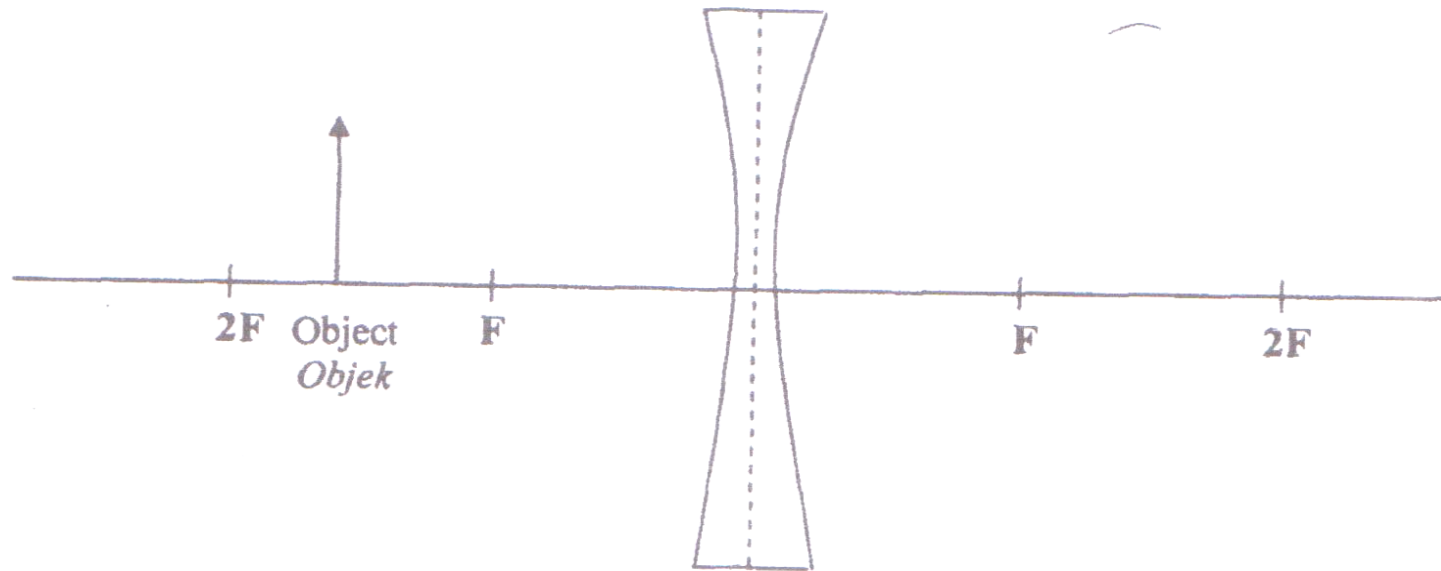


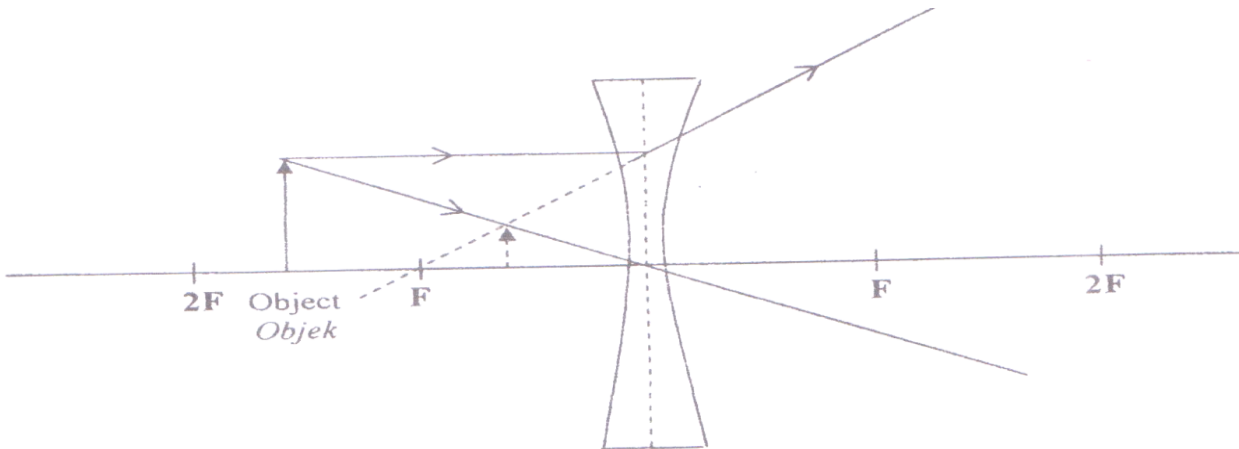
Diagram 2.1
Rajah 2.1

SECTION A ANSWERING TECHNIQUE

Question

(a) Complete Diagram 2.1 to show the formation of image by concave lens.

Answer:



- Notes :
- i. 2 rays with arrow - 1 mark
 - ii. Draw and label image - 1 mark
(image – arrow form, dotted, upright)

SECTION A ANSWERING TECHNIQUE

(b) Measure and write down the height of the image.

Answer: (0.6 ± 0.1) cm

(c) Concave lens in Diagram 2.1 is replaced by convex lens in Diagram 2.2.

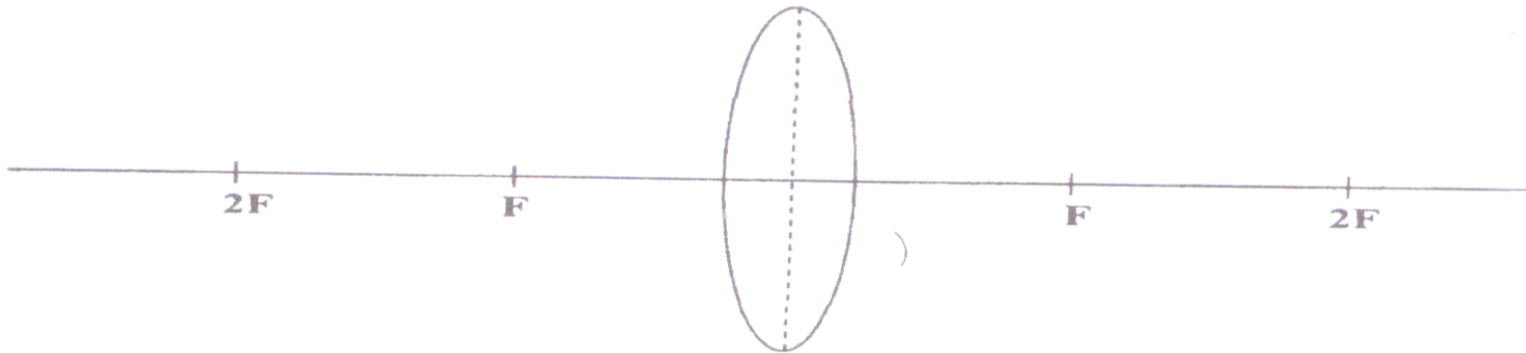
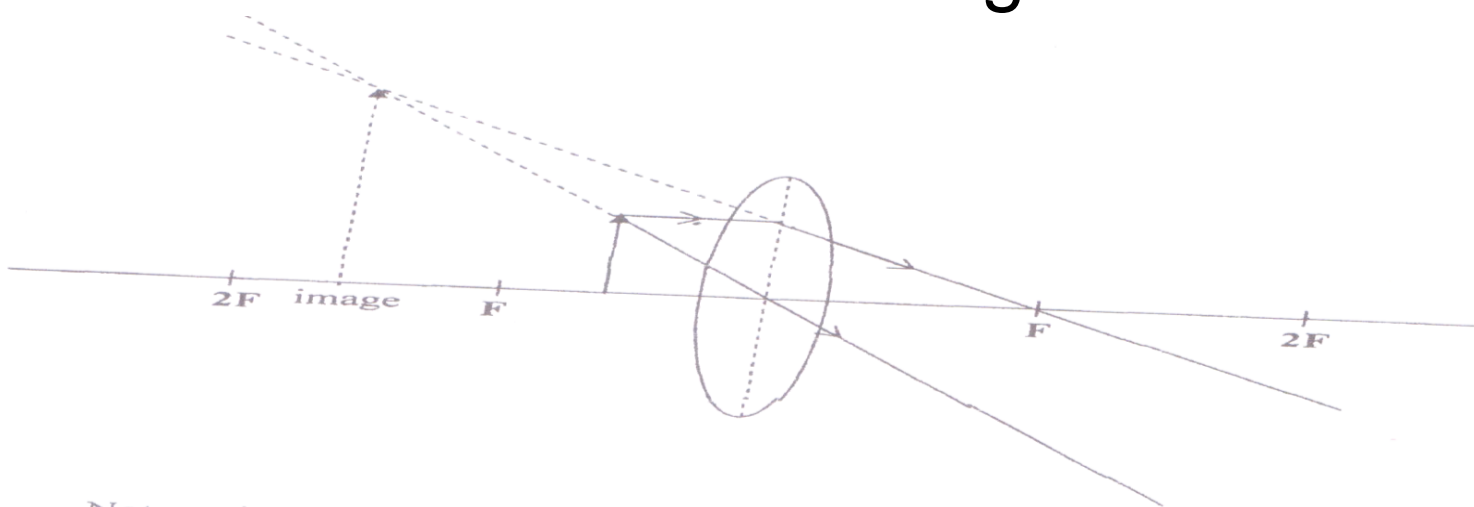


Diagram 2.2
Rajah 2.2

SECTION A ANSWERING TECHNIQUE

The student wants to get a virtual, upright and magnified image. Draw the position of the object and complete Diagram 2.2 to show the formation of the image.



- Notes :
- i. The position of object and label must less than F - 1 mark
 - ii. 2 rays with arrow - 1 mark
 - iii. Draw and label image - 1 mark

SECTION B ANSWERING TECHNIQUE

- Section B tests on **knowledge** that is covered in the syllabus. **No science process skills** are involved.



SECTION B ANSWERING TECHNIQUE

1. Diagram 5 shows the formation of twins.

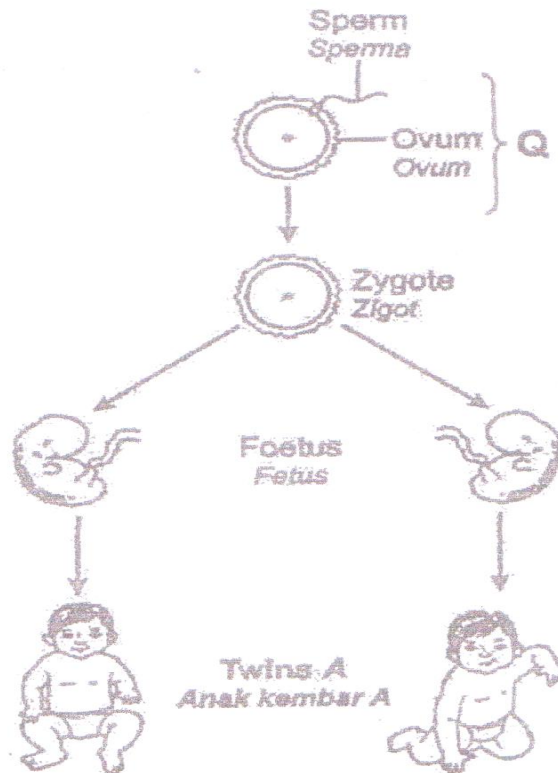


Diagram 5.1
Rajah 5.1

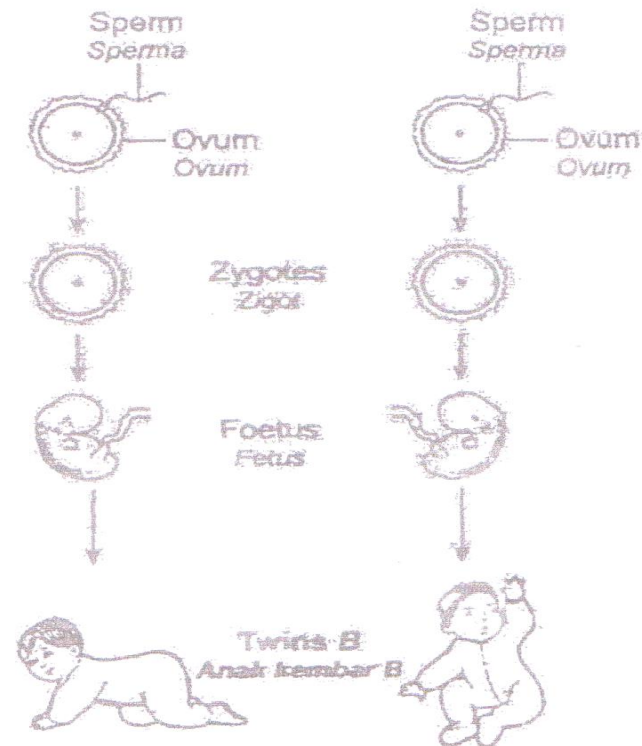


Diagram 5.2
Rajah 5.2

SECTION B ANSWERING TECHNIQUE

(a) Name the type of twins in

(i) Diagram 5.1

Answer: Identical twins

(ii) Diagram 5.2

Answer: Non-identical twins

(b) What will happen if splitting of the zygote in Diagram 5.1 is not complete?

Answer: Siamese twins occur

(c) Name the process of Q in Diagram 5.1?

Answer: Fertilisation

SECTION B ANSWERING TECHNIQUE

(d) State the type of chromosome if twins in Diagram 5.1 are boys?

Answer: $44 + XY$

(e) State one difference between the twins in Diagram 5.1 and Diagram 5.2.

Answer: Twins in Diagram 5.1 are of the same sex whereas twins in Diagram 5.2 can be of the same or different sexes/

SECTION B ANSWERING TECHNIQUE

Twins in Diagram 5.1 share the same placenta whereas twins in Diagram 5.2 do not share the same placenta/ Twins in Diagram 5.1 are genetically identical whereas twins in Diagram 5.2 are genetically different.



SECTION B ANSWERING TECHNIQUE

2. Diagram 5.1 shows the endocrine glands.

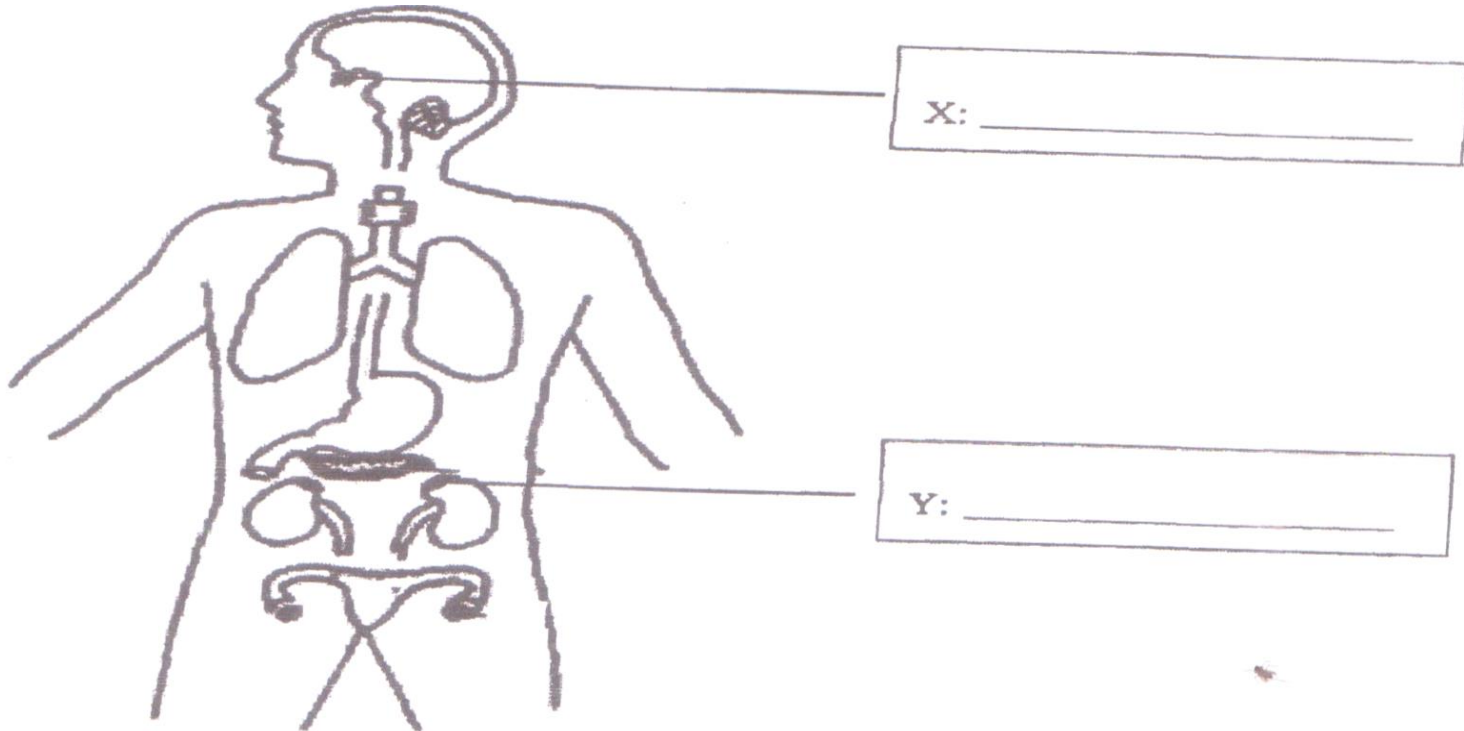


Diagram 5.1
Rajah 5.1

SECTION B ANSWERING TECHNIQUE

Question

(a)(i) Label X and Y.

Answer:

X: Pituitary gland

Y: Adrenal gland

(ii) State **one** function of Y.

Answer: Secretes adrenaline which increases heart rate and breathing rate

SECTION B ANSWERING TECHNIQUE

(b) Diagram 5.2 shows a disease caused by undersecretion of a hormone in human body.



SECTION B ANSWERING TECHNIQUE

(i) Name the endocrine gland that is involved.

Answer: Thyroid gland

(ii) State the disease in Diagram 5.2.

Answer: Goitre

(c) Mark (✓) the foods that should be taken by the patient in Diagram 5.2.



Prawn

✓



Meat



Crab



Eggs

SECTION C ANSWERING TECHNIQUE

- Only one science process skill is tested which is experimenting for Question 10.
- For experimenting, questions asked are:
 - (i) Hypothesis
 - (ii) Aim of the experiment
 - (iii) Identification of variables
 - (iv) List of apparatus
 - (v) Procedure
 - (vi) Tabulation of data

SECTION C ANSWERING TECHNIQUE

- For Question 11 and 12, knowledge that is covered in the syllabus is tested.
No science process skills involved.

SECTION C ANSWERING TECHNIQUE

1. Study the following statement.

Nutrients affect the growth of plants

You are given:

- Complete culture solution
- Culture solution without nitrogen
- Culture solution without phosphorus
- Three test tubes

(a) Suggest one hypothesis to investigate the above statement.

Answer: Plants need complete nutrients for healthy growth

SECTION C ANSWERING TECHNIQUE

(b) Describe an experiment to test your hypothesis in 10 (a) based on the following criteria.

(i) Aim of the experiment

Answer: To study the effect of nutrients on the growth of plants

SECTION C ANSWERING TECHNIQUE

(ii) Identification of variables

Answer:

Manipulated variable:

Type of culture solution/ Complete culture solution, culture solution without nitrogen and culture solution without phosphorus

SECTION C ANSWERING TECHNIQUE

Responding variable:

Growth of plant/ seedling

Number/ colour/ size of leaf

Length/ size of roots

Constant variable:

Volume of culture solution/ Type of plant/
seedling

SECTION C ANSWERING TECHNIQUE

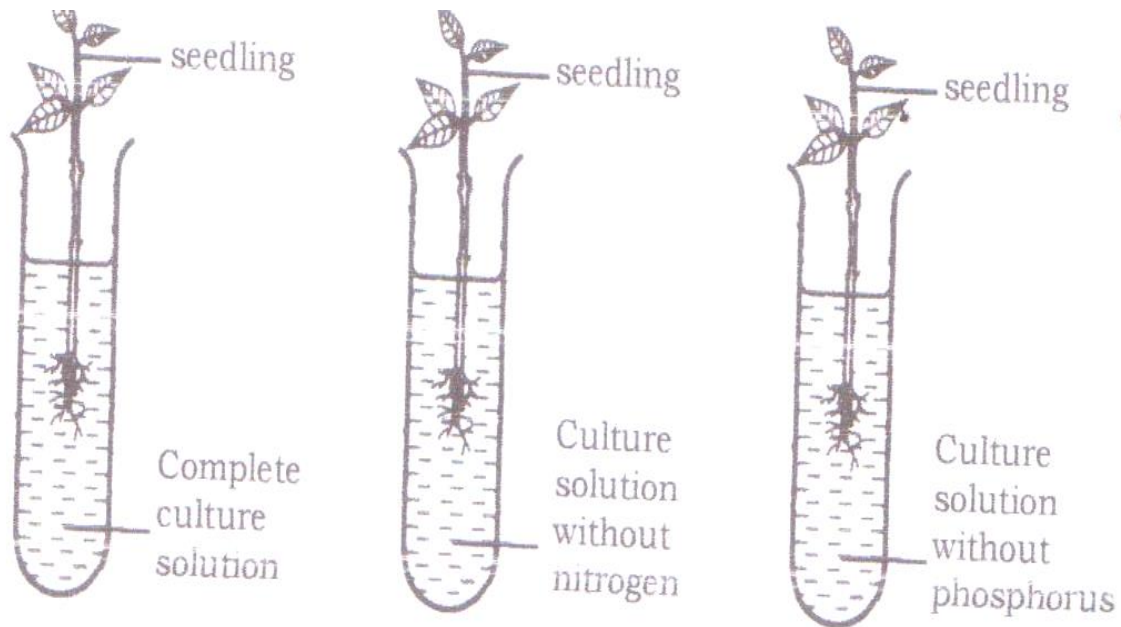
(iii) List of apparatus and materials

Answer: Complete culture solution,
culture solution without nitrogen,
culture solution without
phosphorus, test tubes and
plant/ seedling

SECTION C ANSWERING TECHNIQUE

(iv) Procedure

Answer:



SECTION C ANSWERING TECHNIQUE

Note: Diagram point 1 and point 2

1. Put complete culture solution in test tube A.
2. Put seedling/ plant in test tube A.
3. Repeat step 1 and 2 by using culture solution without nitrogen and culture solution without phosphorus.
4. The apparatus are left for two weeks.
5. The growth of seedling/ plant is observed after two weeks.

SECTION C ANSWERING TECHNIQUE

Note:

If the student write:

1. Put:

(a) complete culture solution in test tube A

(b) culture solution without nitrogen in test tube B

(c) culture solution without phosphorus in test tube C

SECTION C ANSWERING TECHNIQUE

2. Put seedling/ plant in each test tube

Student score 3 marks for point 1, 2 and 3

(iv) Tabulation of data

Type of culture solution	Growth of seedling/ plant
Complete culture solution	
Culture solution without nitrogen	
Complete solution without phosphorus	

SECTION C ANSWERING TECHNIQUE

Note:

1. Manipulated variable and responding variable are written on the title of table
2. Data for manipulated variable is written
3. Data for responding variable is left blank
4. Ignore any data for responding variable written

SECTION C ANSWERING TECHNIQUE

2. (a) State **four** differences between nervous coordination and hormonal coordination.

Answer:

Nervous coordination	Hormonal coordination
Information in the form of nerve impulses	Information in the form of hormone
Information is carried through neurone	Information is carried by the bloodstream
Speed of information is fast	Speed of information is slow
The effect will last for a short period of time	The effect will last for a long period of time
The target organ is one part of the body	The target organs are many parts of the body

SECTION C ANSWERING TECHNIQUE

(b) Diagram 11 shows four types of endocrine glands.

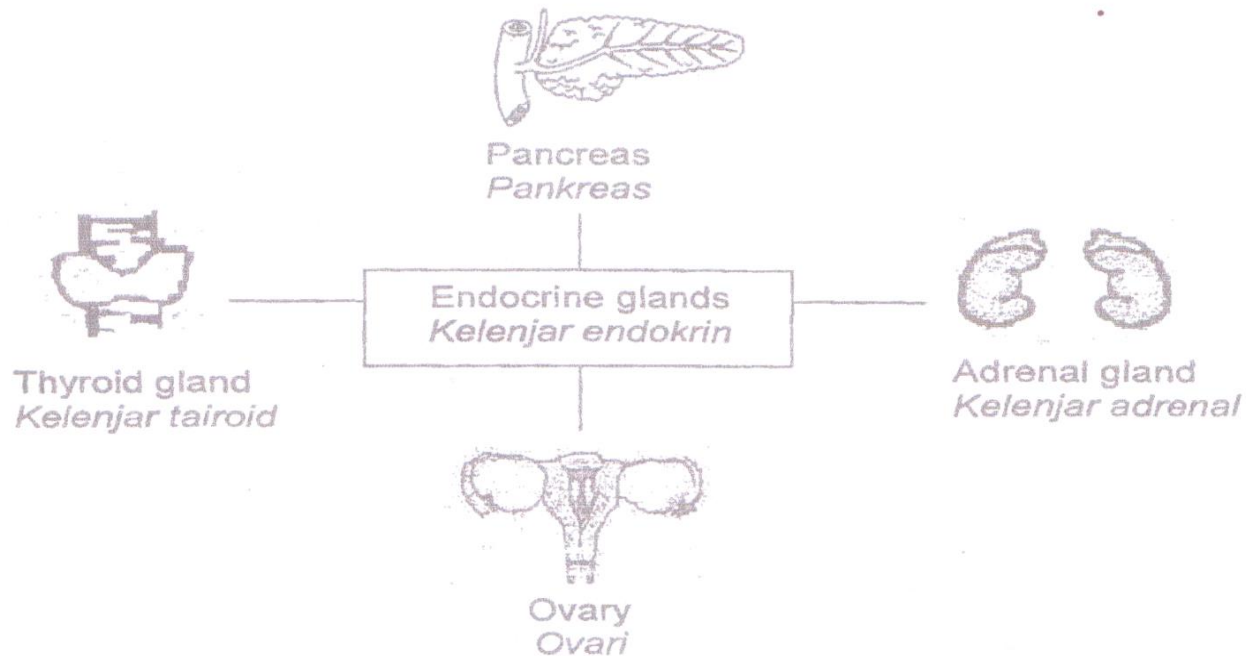


Diagram 11
Rajah 11

SECTION C ANSWERING TECHNIQUE

Study the endocrine glands in Diagram 11 and construct the concept of endocrine glands. Your answer should be based on the following aspects:

- (i) Identify the **two** common characteristics.

Answer:

- (i) The glands have no duct/ ductless glands
(ii) The glands secrete hormone into the bloodstream

SECTION C ANSWERING TECHNIQUE

(ii) Construct the initial concept of endocrine glands.

Answer: Glands that have no duct/
ductless glands which secrete
hormone into the bloodstream
are endocrine glands.

**Note: To construct initial concept, the
object that you want to define must
be written at the back.**

SECTION C ANSWERING TECHNIQUE

(iii) State another example of endocrine gland and one non-example of endocrine gland.

Answer:

Example: Pituitary gland and testis

Non-example: Sweat gland and salivary gland

SECTION C ANSWERING TECHNIQUE

(iv) Explain the actual concept of endocrine glands.

Answer: Endocrine glands are glands which have no ducts/ ductless glands which secrete hormone into the bloodstream.

Note: To construct actual concept, the object you want to define must be written in front.

SECTION C ANSWERING TECHNIQUE

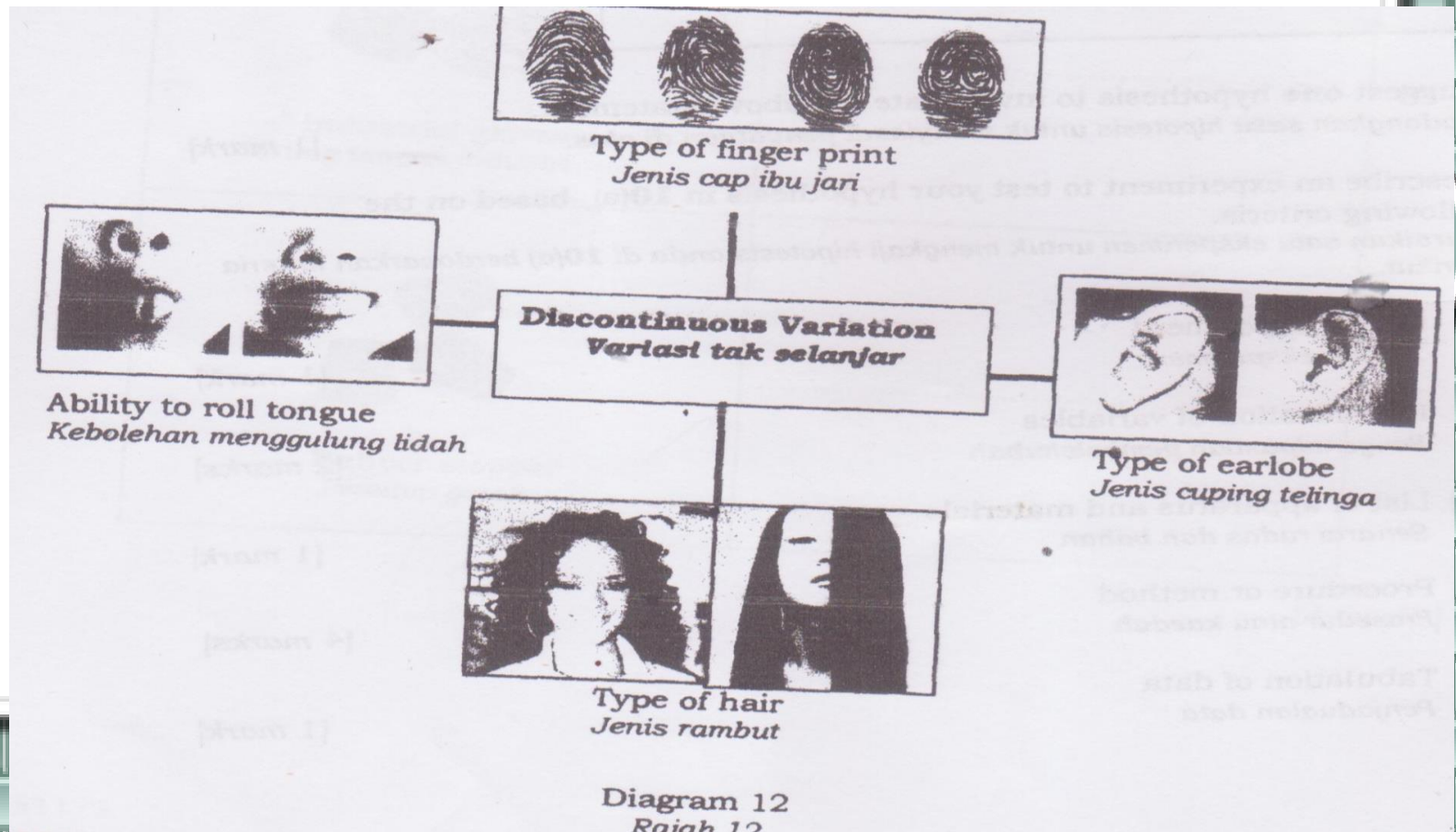
3. State **four** differences between mitosis and meiosis.

Answer:

Mitosis	Meiosis
Produces two daughter cells	Produces four daughter cells
Daughter cells are genetically identical to parent cell	Daughter cells are genetically different from parent cell
Daughter cells have same number of chromosomes as the parent cell	Daughter cells have half the number of chromosomes compared with the parent cell
Crossing over does not occur	Crossing over occurs
Cytoplasm divides once	Cytoplasm divides twice

SECTION C ANSWERING TECHNIQUE

(b) Diagram 12 shows four characteristics in discontinuous variation.



SECTION C ANSWERING TECHNIQUE

Study the characteristics in Diagram 12 and construct the concept of discontinuous Variation. Your answer should be based on The following aspects:

- (i) Identify **two** common characteristics

Answer:

- (i) Show distinct differences
- (ii) Cannot be measured
- (iii) Shows discrete distribution

SECTION C ANSWERING TECHNIQUE

(ii) Give **one** other example of discontinuous variation.

Answer: Blood group/ Presence of dimples

(iii) Give **two** examples of non-discontinuous variation.

Example:

(i) Weight

(ii) Height

(iii) Skin colour

SECTION C ANSWERING TECHNIQUE

(iv) Relate the common characteristics to construct the concept of discontinuous variation.

Answer:

Discontinuous variation is a type of variation which show distinct differences and cannot be measured.

Note:

Relate 2 common characteristics to construct the actual concept of discontinuous variation.

Thank
You!

