

GROWTH AND DEVELOPMENT MARKING SCHEME

1. 1989 Q9 P1

- IAA/Auxins produced by terminal bud:prohibits growth of lateral buds,when cut,the suppression ceases thus auxiliary buds sprout.

1. 1990 Q11 P1

- a) – Conditions necessary for the germination of seeds/to show that water Oxygen and warmth are needed for germination.
- b) –To absorb all oxygen from the jar
- c) –C- To show that water is needed for germination of seeds
D- To show that warmth is needed for germination
- d) Jar A- Seeds would not germinate
Jar B- Seeds would have germinated
- e) i) Scarification i.e scratching to make impermeable seed coat permeable
ii) Vernalisation- Cold treatment e.g some species of wheat-Burning

2. 1990 Q16 P1

- a) Secondary thickening is facilitated by meristematic cells known as the cambium; located between the xylem and phloem in the vascular bundles
- The Cambium divides radially to form a ring of tissue;the xylem inside the ring and phloem outside the ring; cells of the cambium ring divide to form secondary phloem outside intervacular cambium divides to form secondary parenchyma thereby increasing the growth of medullary rays;more xylem is formed than phloem;thus pushing phloem and cambium ring outwards;the rate of secondary growth is dependent on seasons/rains;resulting in annual rings.
- Cork Cambium tissue divides to form new cork/bark to accommodate increased growth on outside and secondary cortex on the inside

b) EITHER

Choose /identify a young leaf (just unfolded); use the same leaf throughout; measure (total) length of leaf. (Acc measurement of any part of the leaf);Record;Repeat at regular intervals;until no more change in length/constant length.

OR

Choose /identify a young leaf(just unfolded);use the same leaf throughout;Trace the outline on a graph paper and work out the area;Record;Repeat at regular intervals until constant area.
average rate of growth is equal to total increase in area divided by

the period of time taken to achieve final area

3. 1992 Q15 P1

- a. –Apical bud produces auxin/hormone/a growth substance which inhibits the development/growth of lateral shoots/buds/apical dominance; removal of terminal buds cause the growth/development and sprouting of lateral buds.
- b. The pruning of coffee/tea/hedge etc for pruning only
- c. More yield/Production/Bushy edge
Acc. More bushy or thicker if it is above hedge

4. 1993 Q16 P1

- a)- Low O₂/Low in O₂/all used up; and increase in O₂/high CO₂/A lot of CO₂; NB. Element of change.
- b) – Germinating seeds respire/use O₂ and release CO₂ only
- c) – Absence of light;impermeability of seed coat to water;under-developed embryo/immature embryo;lack of growth hormones/enzymes
- Presence of inhibitors

5. 1993 Q17 P1

- a) i) – High or Conc.retards/slows down/inhibits germination;while low conc has less inhibition/promotes germination

ii)Higher conc of solution X retards/slow down/inhibits growth in roots and shoots while low conc has less inhibitory effect/promotes/favours growth
In roots and shoots. But growth is greater in roots at all concentrations
Acc. The higher the concentrations of solution X the lower the growth of seedlings
- b) At 80% no growth (in shoots and roots);At 105 the shoots have grown upto 12mm;while the roots grow up to 42mm;OR at 10%Y has a higher stimulating effect on growth of roots than shoots;At 80% Y has no stimulating effect on growth of roots or shoots)
- c) $\frac{\text{No germinated}}{\text{Original number}} \times 100$

d) At lower concentrations there was a greater rise in both germination and growth in Y than X; However both X and Y are inhibitors of growth and germination/ at high concentration Y inhibits both germination and growth more than X.

e) – Air/oxygen; warmth/optimum temperature/suitable temperature. Rej Heat

f) – Promotes cell division; cell elongation; development of abscission layer; growth of ovaries into fruits=/causes parthenocarpy; inhibits growth of lateral buds/promotes apical dominance/promotes growth of adventitious roots/lateral roots

6. 1994 Q7,10 P1

7. – Food stored is used (mobilized) up for respiration and growth
(Respiration = $\text{CO}_2 + \text{H}_2\text{O} + \text{Energy}$)
the idea of respiration must clearly come up.

10. – They promote all/intermodal/elongation/rapid cell division
- Promote fruit formation without fertilization/Parthenocarpy

7. 1994 Q18 P1

a) i) 7-8 minutes

ii) 11-12 minutes

b) – Bean seeds

Because the curve is steeper than that of acacia; more seeds germinating on exposure to hot water for a short time. (OWTTE)

c) i) Destruction by heat of the embryo and enzymes/denaturing of enzymes.

ii Acacia seeds were dormant, heat broke dormancy; the more the heat the better the offer.

d) i) At 100°C (comparatively) fewer/no bean seeds will germinate but more/all acacia seeds will germinate.

ii) At 5°C , no acacia seeds will germinate (comparatively) all/most $\frac{50}{100}\%$ will germinate

8. 1995 Q12 P1

(a) To absorb CO_2 ; reacts with CO_2

(b) To provide moisture to germinating seeds. Accept water for moisture

(c) (ii) Oxygen in the tube is taken up for germination CO absorbed by higher pressure outside tube

9. 1995 Q15 P1

- a. - Sigmoid of the curve shown
- b. - 92 acc. 93
- c. $\frac{110 - 78}{4} = 8.0$ (cells/ min)
- d. 31.5 (mins)
- e. (i) A to B Lag phase / slow growth phase
(ii) B to C Exponential /log/rapid growth phase
- f. Slow/ reduced growth due to limiting environmental factors (Accept any example) rate of multiplication is almost the same as the death rate, Acc: few cells are still diving Rej. Growth for multiplication but acc. Reproduction.
- g. – Low death rate/ low mortality;
 - Rej. Decrease in death rate/ reduced death rate
 - High birth rate/ high fertility acc. Increased birth rate
 - Improved medical services: Acc. Increased medical facilities
 - Enough food/ availability of food
 - Absence of war/ political stability/ peace
 - Improved standard of living
- h) Measure the total area of the habitat, throw or mark out the quardrat in the area for the study; at random. Identify label the various species of the plants in the quardrat; count plants of each species; record the numbers, repeat the process (owtte) work out the average per quardrat for each species in the area/ calculate the population for the total area in Nairobi.

10. 1996 Q10 P1

- (a) O₂ is necessary for germination
- (b) Germination in B; no fermentation

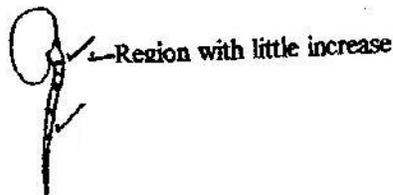
11. 1997 Q18 P1

- (a) (i) Bamboo plants
4 and 6
- (ii) Maize plants
12 and 14
- (b) (i) Bamboo
- (ii) It had accumulated more weight and therefore greater dry weight

- c) Maize plants have reached maturity/maximum height food being manufactured (in green parts); is utilized for growth storage primary in the cob.
- d) Increase in weight – bamboo reject both increase/ decrease accept bamboo and maize increase/ decrease.
- e) (i) *Dry weight instead of fresh weight*
Fresh weight is dependant on the amount of water present in the plants and this fluctuates depending on environmental factors.
- (ii) *Weight and height*
Both given a better measure of growth
- f) *Average height*
At every 2 weeks measure the height of samples of plants in each plot:
Divide the total height by the number of plants in each of plot.
- Average dry weight*
Harvest the sample measure of the plants in each plot; dry to constant weight and divide by the number of plants
- g) Being monocots/ lack (Inter) vascular cambium:

12. 1999 Q12 P1

- a) i) -Region of elongation (rapid) growth in a root.
-Region with more increase ink mark
-To provide moisture/water for growth (germination)
- ii)



Region with more increase ink (mark)

- iii) To provide moisture/water for growth (germination)
- b) i) Oxygen
Oxidation of stored food; to provide energy (for germination)
- ii) Cotyledons
Store food necessary for germination; protecting the plumule.

13. 2001 Q15 P1

- (a) Water, temperature moisture (Acc. Warmth)
- (b) Mobilize/ hydrolyze stored food/ active enzymes/ breaking of dormancy softening the testa / seed coat (acc. As a solvent/ transport media.)
- (c) Setup A – those in set up A will germinate
Setup B- those in set up B will not germinate
Setup C- those in set C will not germinate

14. 2002 Q4 P1

Endosperm material was being oxidized / hydrolyzed / converted into new cytoplasm new material for growth / food used for growth.

15. 2002 Q19 P1

- Indole acetic acid/IAA/ Auxins

- Promote cell division tropic responses, (accept cell division in cambium)
- Promote formation of abscission layers/ bring abrupt leaf – fall
- Promote fruit formation (parthenocarpy)
- Promotes cell differentiation (of vascular tissue)
- Causes apical dominance/ inhibit growth and development of lateral buds
- Promote growth of adventitious roots (on stems)
- IAA + cytokine induce formation of callus tissue (during healing of wounds)
N.B if this point for cytokines it should be marked

GIBBERELLINS (accept GA3)

- Promotes cell division / cell elongation in dwarf varieties
- Parthenocarpy/ initiating formation of IAA/ setting of fruits after fertilization
- Formation of side branches (of stems) and dormancy (in buds); inhibit growth of adventitious roots.
- Activates (hydrolytic) enzymes during germination/ promotes germination of seeds/ breaks seed dormancy.
- Affects leaf expansion and shapes / retard leaf abscission

CYTOKININS' Accept any correct example kinetin & zeatin

- Breaks dormancy (in some species); promotes flowering in some species
- Promotes cell division (in presence of IAA)
- Stabilizes proteins and chlorophyll
- Promotes root formation
- Low concentration encourages leaf senescence/ high concentration protein increased cell enlargement
- Promotes flowering (in some species)

Ethylene / Ethene / C2H4 (reject ethane)

- Stimulate lateral bud development
- Ripening of bananas/ fruits
- Induces thickening of stem/ inhibits stem elongation
- Promotes germination of certain seeds/ acc promotes flowering in pineapples
- Causes abscission of leaves/ fruits/ leaf fall abscisic acid / ABA
- High concentration of ABA stomata closure (by interfering with uptake of potassium ions
- Inhibits germination/ growth of embryo/ cause seed dormancy
- Causes abscission of leaves/ fruits / leaf fall
- Inhibit elongation growth, inhibit sprouting of bud/ induces dormancy in buds (accept Dormin causes/ dormancy in buds/ seeds

Traumatin

- Heal wounds by callus tissue formation

Florigens

- Promote flowering

16. 2003 Q7 P1

- a) Zone of cell division Acc cell multiplication
Zone of cell elongation / enlargement; Acc expansion for elongation

- b) To protect root tip

17. 2004 Q17 P1

- (a) Graph next page

- (b) 38.5 (mg); Acc. + 0.5 (i.e. 38 – 39)

- (c) (i) Hydrolysis of starch into simple sugars; which are translocated to the embryo;
Respiration/ to give energy/ heat/ gases

Acc. Simple sugar oxidized

Rej. Oxidation of starch/ endosperm.

- (ii) New materials are synthesized from protein); bringing about growth of embryo; acc new cells/ protoplasm synthesized

- (iii) The rate of respiration is faster than that of synthesis of materials for growth

- (iv) First leaf (carried out photosynthesis) leading to growth

- (d) (i) Presence of abscisic acid/ germination inhibitors;

Embryo not fully developed

Absence of hormones/ enzymes that stimulate germination

Impermeable seed coat; rej hard seed coat

Acc. Inactive enzymes/ hormones/ absence of gibberellins/ cytokinins.

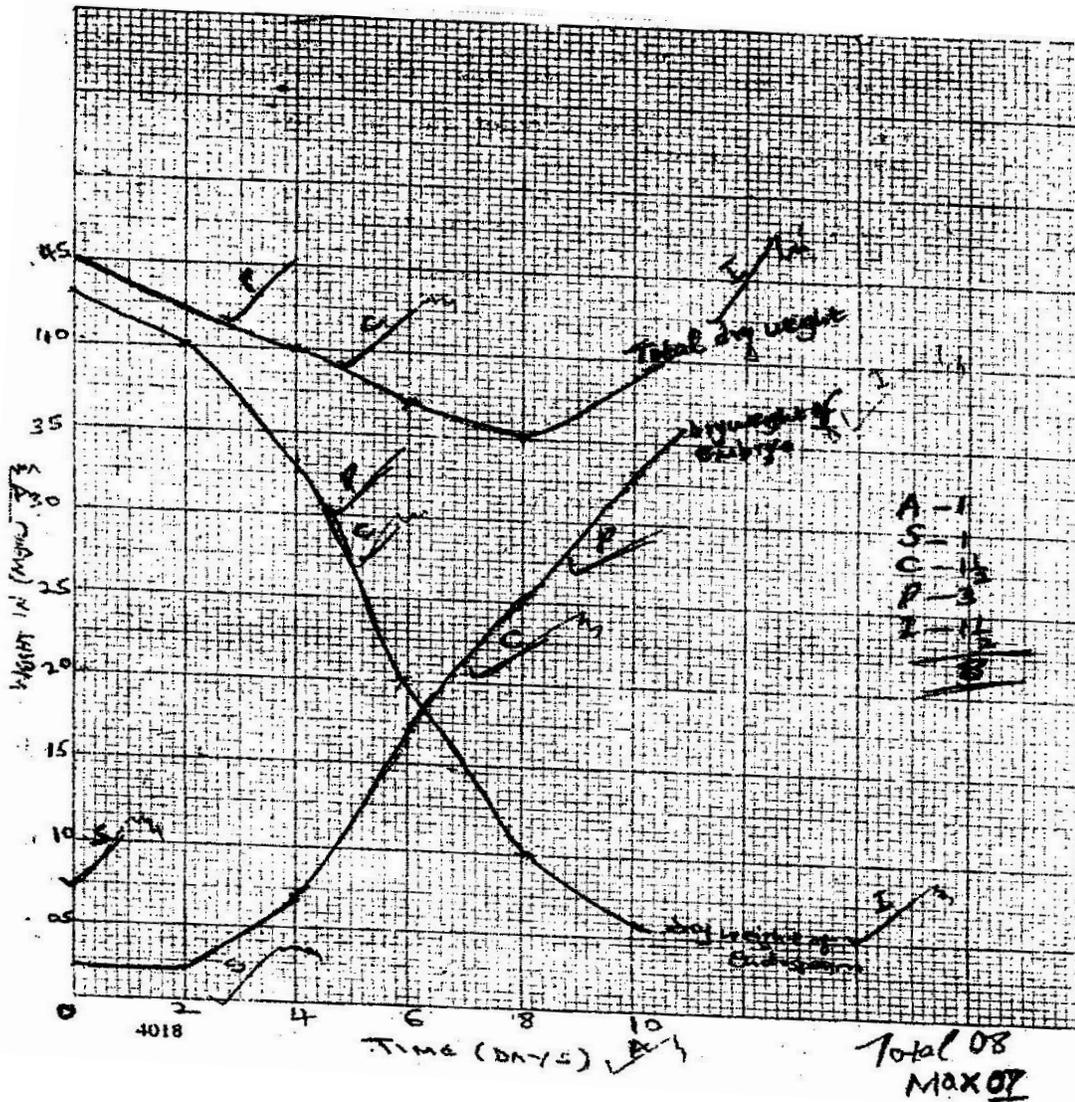
(ii) – Unsuitable / unfavourable temperature

- absence of light
- lack of water
- lack of oxygen
- rej. Premature for immature

e) Dense cytoplasm

- Thin cell wall
- Absence of vacuoles (cell sap)

f)



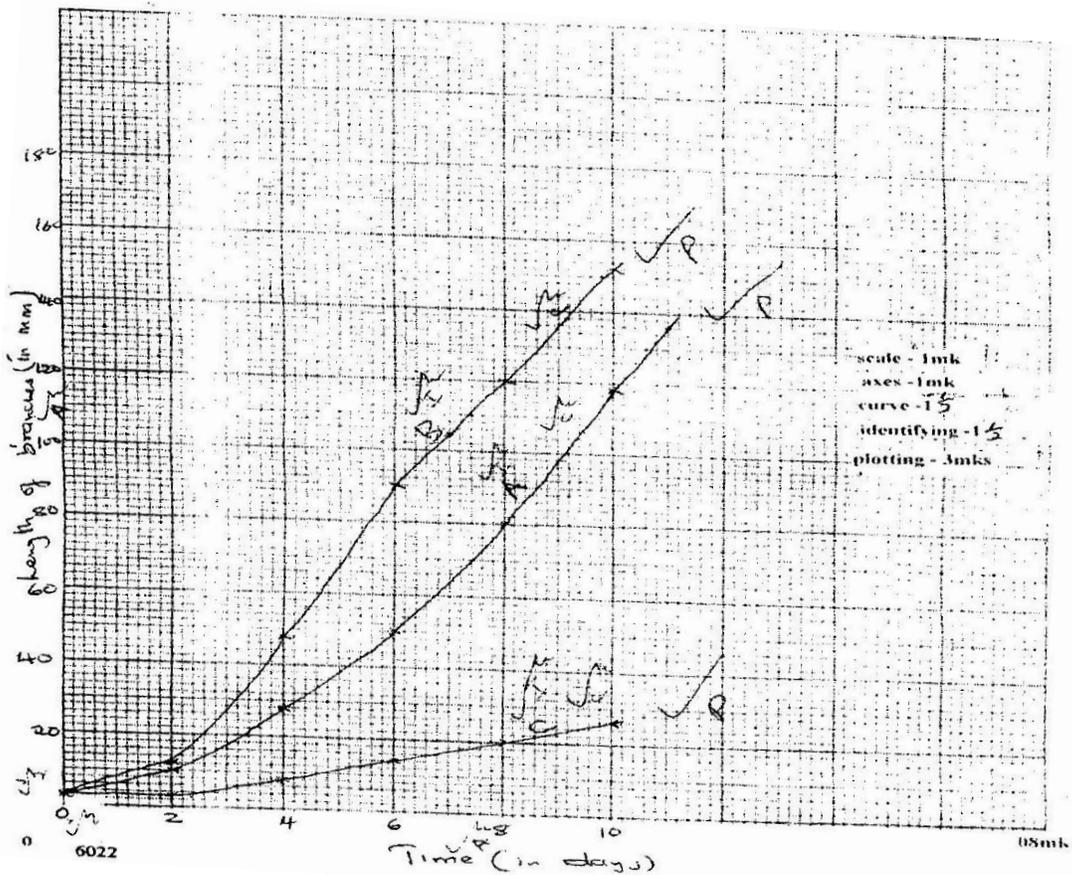
18. 2005 Q8 P1

- Embryo may not yet be fully developed
- Presence of chemical inhibitors e.g. abscisic acid, inhibit germination.
- Low hormone and enzyme concentrations e.g. gibberellins
- Hard and impermeable seed coats, preventing air and water entry.
- Low temperatures which inactivate the enzymes.

19. 2006 Q14 P1

- (a) Epigeal – cotyledon are brought above ground surface
 Hypogeal- cotyledon remains below surface.
- (b) Required in aerobic respiration/ oxidation; to release energy from food reserve for germination; rej. Oxidation for starch (i.e. starch cannot be oxidized before hydrolyzed).

20. 2006 Q6 P2



(b) (i) 105 + 1 (mm)

(ii) 134 – 140 (mm)

(c) **Graph A:** The tip of the shoot which was removed contained indole acetic acid (IAA); which causes apical dominance/ inhibits growth/ development of more lateral buds; hence lateral buds sprouted/grew.

Graph B; the gibberellic acid which was added on the cut. Promotes formation of lateral branches of stems, hence the fast growth of branches on shoot b.

Graph C; The shoot tip which remained intact contains IAA which inhibits growth/ development of lateral buds; hence little change of length of lateral branches.

(d) Control

(e) Increase productivity

(f) Promote cell division, and cell elongation

21. 2007 Q19 P1

(a) – absence of water (moisture)

- Unsuitable temperature

- Lack of oxygen

- Lack of light

(b) Hypocotyl

22. 2007 Q23 P1

(a) Auxin

(b) Growth response due to touch of a part e.g. tendrils

23. 2008 Q17 P1

(a) Few dividing cells/ cells not adjusted to surrounding environment

(b) Most cells fully differentiated/ rate of cell division equals rate of cells dying

24. 2008 Q21 P1

(a) State during which a seed cannot germinate/ state of rest before seed germination; rej inability to germinate.

(b) Absisicic acid

25. 2009 Q4 P1

(a) (seed) dormancy; / *Rej Dormincy*

(b) (i) Epigeal

(ii) Protection of the delicate plumule; Pulls the Cotyledons above the ground; *ref shoot*

26. 2009 Q11 P1

(a) Auxiliary / lateral buds spront / bronches will be formed;

(b) Decapitation removes the hormone / auxins / IAA which is produced in the terminal bud / the stem tip; abscission / removal of the hormone / auxins / IAA promote branch development of auxiliary lateral buds;

27. 2010 Q30 P1

The inhibition of growth of lateral buds; by auxins; produced by the growing apical bud.

28. 2010 Q1 P2

- a) Respiration (Rej: external respiration/ anaerobic respiration)
Acc: aerobic respiration.
- b) i) Rise/ increase in thermometer / temperature reading.
ii) stored starch/ glucose/ carbohydrates in germination seeds are broken down/ oxidized to get energy. Some of the energy is released to get energy; some of the energy is released as heat.
- c) To kill bacteria/ fungi/ micro-organisms; that would cause decay/ decomposition / respire. (of the bean).
- d) To conserve heat/prevent heat loss to surrounding
- e) Use similar set up with dead disinfected seed.
Use dead disinfected bean seed/ use of dry bean seeds; acc formaldehyde / formalin for disinfection sodium hypochlorite.

29. 2011 Q28b,29 P1

28b) Accelerates growth of shoots; Can inhibit growth of roots; (2marks)

29.

- Active enzymes; provide a medium for enzymatic activities (to break down stored food to soluble form.
- Hydrolyses; dissolves food material;
- Is a medium of transportation of dissolved food substances to growing regions of radical and plumule;
- Softens seed coat to facilitate emergence of radicle; (4marks)

30. 2011 Q5 P2

- a) Anthers are below the stigma ; (to minimize self pollination)
Petals are large / conspicuous for insects to land on / to attract insects; (to encourage cross pollination).

(b) (i)

- L is hanging outside the body to ensure optimal temperature for sperm production; has (many, long and coiled) Seminiferous tubules to increase the surface area for production of sperm
- Presence of interstitial cells that secrete androgens / testosterone hormone;

(ii)

- Produces alkaline fluid that neutralizes acid in the urethra; the fluid contain nutrients for the sperms and also activates sperms;

31. 2011 Q8a P2

(a)

- The exoskeleton is made of chitin; chitin is not evenly distributed / is thin and (flexible) at joint; for movement; exoskeleton is secreted by the epidermal cells; when still soft it allows for growth of the insect; when in contact with air it hardens/ limiting growth; it is shed regularly; thus regulating the growth of insect; it also supports the internal structures; because it is hard; it protects internal organs from mechanical damage; it is water proof; preventing / reducing water loss / desiccation; of the insect.
- It also provides a surface for attachment of muscles; it is light / low density ; for flight; can be modified to form hard parts / jaws; for biting / piercing/ sucking/ grinding; it is pigmental; for camouflage; can be transparent at some places for allowing entry of light into the eye; for camouflage in water.

33. 2012 Q20 P1

Height/length;weight/mass/dryweight;surface area;

34. 2012 Q24 P1

small/round;central/prominent nucleus; dense cytoplasm; no vacuoles;
continuously/rapidly dividing; thin cell walls