PROBABLE SOLUTIONS TO SJSSSN UCE CBC FINALISTS SEMINAR 2024

Element of contrast one.

Item one

Note; all problems should be well explained with natural resources affected.

The problems in Banda include;
- Encroachment
- Swamp reclamation
- Habitat loss/destruction
- Loss of biodiversity/life forms
- Flooding
- Global warming/Greenhouse effect
- Devegetation

The residents can overcome the above problems by;
- Relocating the township to another place.
- Revegetation e.g., afforestation.
- Digging water channels.

The values of conserving the natural environment include;
- The swamp acts as a breeding place ground for aquatic organisms like frogs
- The swamp is a habitat to many organisms, both plants and animals.
- The swamp is a source of food to several animals including man.
- It is a water catchment area for large waterbodies.
- Swamps purify water for other waterbodies.
- The swamp contributes to the rainfall cycle.

Item two.

Note; all problems should be well explained with natural resources affected.

The problems include;
- Encroachment
- Water pollution
- Over fertilisation/Eutrophication
- Loss of biodiversity
- Silting of the river
- Soil erosion
- Flooding

The solutions to the above problems include;
- Relocate the factory to a less vitally damaging area
- Treat the factory effluents
- Clear the algal blooms from the water sources

- Desilt the river channel
- Plant cover crops along the river banks

The values of conserving the river and the surrounding area include;
- The river is a breeding ground for aquatic animals
- The river is a habitat for aquatic organisms
- The river contributes to the rainfall cycle
- It is a source of food (e.g., fish) to man

Item three.

Note; the essay should include all problems well explained with natural resources affected. The solutions to the problems should be well explained.

The origin of the problems in Murchison Falls National Park include;
- Overpopulation (of lions)
- Interspecific competition
- Loss of biodiversity
- Bush burning
- Devegetation
-Habitat loss
- Air pollution

The problems above can be worked upon in the following ways;
- Reducing the predator population
- Introducing alternative food sources for the lions
- Revegetation e.g., afforestation
- Avoiding bush burning

The relevancy of the natural interactions include;
- Ensure feeding relationships are maintained
- Promote biodiversity and conservation
- Promote eco-tourism whose returns improve the life of man.

Item four

Cutting trees/forest left the soil bare which exposed it to agents of soil erosion. Soil erosion caused washing away of nutrients from hill top into the valley, so the soil had more nutrients in the valley than at the hill top. The plants at the hill top developed yellow leaves and stunted growth due to deficiency of nitrogen and magnesium in the soil for production of chlorophyll. This reduces light absorption hence low rate of photosynthesis at the hill top.

Monoculture also caused depletion of nutrients needed by maize after sometime.

Plastic bottles and polythene bags dumped are non-biodegradable, they accumulate in the soil and on the water surface, preventing infiltration of water in to the soil as well as growth of plant roots. Also oxygen supply in to the water is cut off. The fish in the streams suffocate and die. Also water quality in the streams is affected which may cause outbreak of diseases.

These effects can be overcome by;

- Recycling of plastic bottles and polythene bags to prevent their accumulation.
- Reusing used bottles and polythene bags to reduce their accumulation.
- Reducing use of polythene bags and plastic bottles.
- Agroforestry to reduce soil erosion.
- Mixed farming to prevent nutrient depletion in the soil.
- Crop rotation to prevent soil exhaustion.
- Contour ploughing to control soil erosion.
- Application of fertilizers and manure to replace lost nutrients.

The importance of conserving valleys include;

- Maintains habitats of wild animals and aquatic organisms to maintain biodiversity.
- Maintains the quality of water in valleys for human use.
- Maintains soil fertility to sustain agriculture.
- Maintains the valley for future use.

Item five.

(a) - Leaves
- Phloem tissue
- Roots
- xylem tissues

(b) When leaves are removed, the trees fail to carryout photosynthesis, hence cannot manufacture food.
Removal of tree barks destroys the phloem tissues which prevents translocation of manufactured food from the leaves to the storage sites.
Debarking also exposes the xylem tissues which leads to drying or infection of the stem. This affects the translocation of water and mineral salts from roots to aerial parts of the plant.
Digging out the roots destroys them, affecting the process of absorption of water and mineral salts by the trees. This may lead to wilting/drying of the crops.

(c) The trees have buds at nodes and internodes that sprout into new leaves and stem structures.
The trees undergo mitotic cell division at the phloem and xylem tissues to replace the removed structures.
Some trees develop more roots to replace those removed hence survival.
The remaining tree roots develop numerous root hairs for extra support and absorption.

Item six.

(a) The processes affected include;
- Gaseous exchange

- Photosynthesis
- Respiration

The organs affected include;
- Leaves
- Flowers
- Buds

(b) A lot of dust covered the leaves of crops reducing light absorption by chlorophyll in chloroplasts of leaves which reduced the rate of photosynthesis leading to slow accumulation of food/sugars hence stunted growth of crops.

(c) Mitotic division of damaged leaves, buds and flowers allowed regeneration of affected parts to allow photosynthesis, growth and production of fruits.
Production of more flowers and leaves to replace what is destroyed by caterpillars.
Development of more prop roots to increase absorption of water and mineral salts.

Item seven.

(a) - Water shortage
- Deficiency of nitrogen or magnesium
- Reduced photosynthesis (due folding of leaves, closing of stomata and shedding of dry leaves)

(b) Bees carried pollen grains from the anther heads to the stigma of bean flowers during pollination. When the pollen grains land on mature stigma, they germinate and produce pollen tubes which grow via the micropyle to the embryo sac. Its generative nucleus divides by mitosis to form two male nuclei. One male nucleus fuses with the egg cell to form the seed embryo comprising the plumule and radicle. The second male nucleus fuses with the polar nucleus to form the seed primary endosperm. The ovary wall forms the fruit wall and the integuments form the seed coat.

(c) - Production of more roots to increase surface area for water absorption.
- Elongation of tap roots to reach water in deeper layers of the soil.
- Production of more root hairs to increase surface area for water absorption.
- Having/Development of root nodules where the nitrogen-fixing bacteria oxidises nitrogen to form nitrogen compounds used by the plants to recover from nitrogen deficiency.

Item eight.

Oloya has Kwashiorkor due to protein deficiency in his body which led to muscle wasting, swollen abdomen etc and has poor/reduced immunity due to deficiency of vitamin C in his body leading to wounds on the skin.
Feeding on fruits provided the body with vitamin C which was absorbed into the blood stream and used by the body cells to improve on his immunity and recover from the wounds.
Milk contains proteins (caseinogen), vitamins, lactose (milk sugar) and fats (lipids) while millet contains starch and iron.
In the mouth, starch is broken down into maltose by salivary amylase enzyme in saliva, secreted from the salivary glands.

In the stomach, proteins are broken down to polypeptides by pepsin in gastric juice from the gastric glands.
In the duodenum, bile from the liver or gall bladder and pancreatic juice from the pancreas are released. Bile salts emulsify fats into small droplets. Pancreatic juice contains pancreatic amylase which breaks down starch to maltose, trypsin which breaks down polypeptides to peptides and lipase which breaks down lipids to fatty acids.
In the ileum, intestinal juice/succus entericus is released from the intestinal wall, it contains maltase which breaks down maltose to glucose, lactase which breaks down lactose to glucose and galactose, and peptidase which breaks down peptides to amino acids.
These are absorbed by the villi into the bloodstream and transported to the liver and other body cells to be used. Glucose is used for respiration to produce energy; amino acids are used to produce body proteins to gain weight and fatty acids and glycerol form stored fats beneath the skin to gain weight.

Item nine

In the mouth, the food was broken down using teeth. Starch in the food was broken down to maltose by salivary amylase in saliva secreted from the salivary gland. The food was rolled into a ball-like structure called bolus by the tongue and then swallowed. The food moves down the oesophagus by peristalsis.
In the stomach, no chemical digestion of starch occurs.
In the duodenum, secretion of bile juice from the gall bladder or liver and pancreatic juice from the pancreas occurs. Bile salts in the bile juice emulsify fats in to tiny droplets. Pancreatic juice secreted contains pancreatic amylase which breaks down starch to maltose.
In the ileum, intestinal juice/succus entericus from intestinal wall is secreted containing maltase enzyme which completes the breakdown of maltose to glucose. Glucose is then absorbed into the bloodstream by the villi found in the ileum and transported to the liver muscle cells where excess glucose is converted to glycogen for storage. During the race glycogen is converted to glucose that is used for respiration to produce energy. The energy was used for contraction of leg muscles to enable Nagenda run fast enough to win the race.

During the race, oxygen supply was less than the demand, so anaerobic respiration occurred producing lactic acid that accumulated to cause muscle clumps.

After the race, lactic acid diffused from muscles and was carried by blood to the liver were much oxygen inspired was used to oxidise this lactic acid fully to water, carbon dioxide and energy lowering its amount in muscles which allowed recovery.

Item ten

Daniel has lung cancer which causes short breath, chest pain, coughing blood and dry cough. This is because tobacco smoke inhaled contains tar which causes cancer of the lungs.

Lung cancer causes narrowing/blockage of the airway tubes and accumulation of fluid in lungs reducing entry of air into alveoli/short breath.

This reduces gaseous exchange across alveoli hence less oxygen is absorbed in to blood and less oxygen is supplied to tissues reducing energy formation by tissue which caused body weakness.

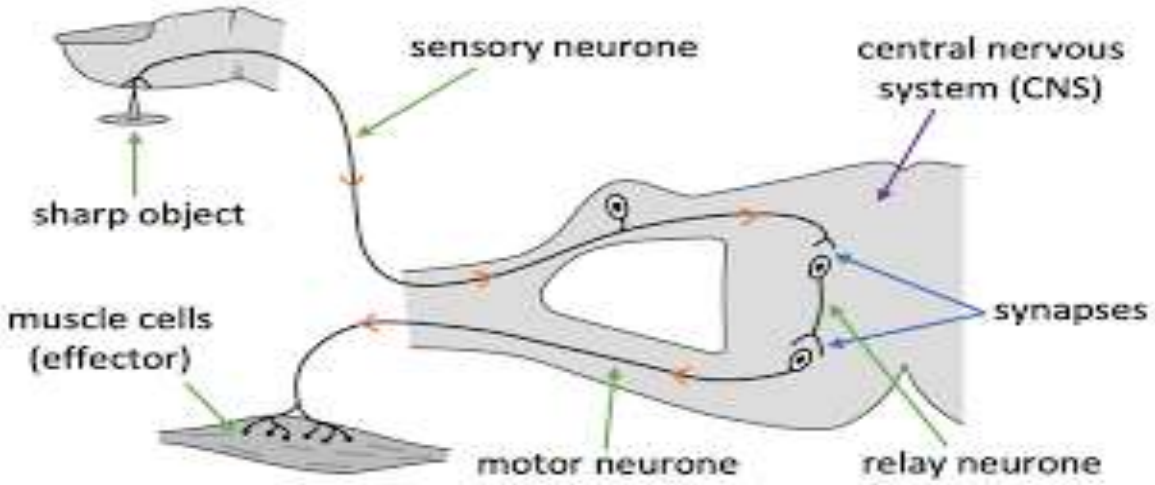
Treatment

- Going for lung transplant to replace affected lungs.
- Feeding on a balanced diet so that the body obtains enough vitamins to boost immunity and enough proteins to allow repair of damaged tissues
- Sticking to medical treatment given e.g., chemotherapy, radiotherapy or immunotherapy.
- Taking on regulated physical exercises to improve on gaseous exchange.

Item eleven.

(a) Heat stimulated thermoreceptors of the skin which generated impulses fired to the spinal cord via sensory neurones. In the spinal cord, impulses from the sensory neurone pass via a synapse to the relay neurones then via another synapse to the motor neurones which carry the impulses to the muscles of the arm, causing them to contract to release the hot pan.

illustration



(b) – Weakened bones
- Back ache
- Awkward posture

(c) Increasing intake of foods containing calcium fluoride and phosphorous to strengthen the bones and increasing the intake of foods rich in vitamin D which is important for absorption of calcium. She can also get nutrient supplements from the hospital for strengthening bones.

Item twelve.

(a) Sound waves are received by the pinnae, directed to eardrum causing it to vibrate. These vibrations are transmitted and amplified by ear ossicles which vibrate in the order; malleus (hammer), anvil (incus) and stapes (stirrup). The vibrations are passed via the oval

window to the cochlea, stimulating sensory cells in the cochlea that generate impulses which are transmitted via the auditory nerve to the brain for interpretation.
The brain interprets this sound as danger and sends impulses to the adrenal gland, causing release of adrenaline into the bloodstream which is transported to different parts. Adrenaline caused, increase in heart beat rate to increase oxygen supply to the muscles for respiration, increase in breathing rate to supply the body with more oxygen for respiration and dilation of the pupil to allow more light to into the eye.

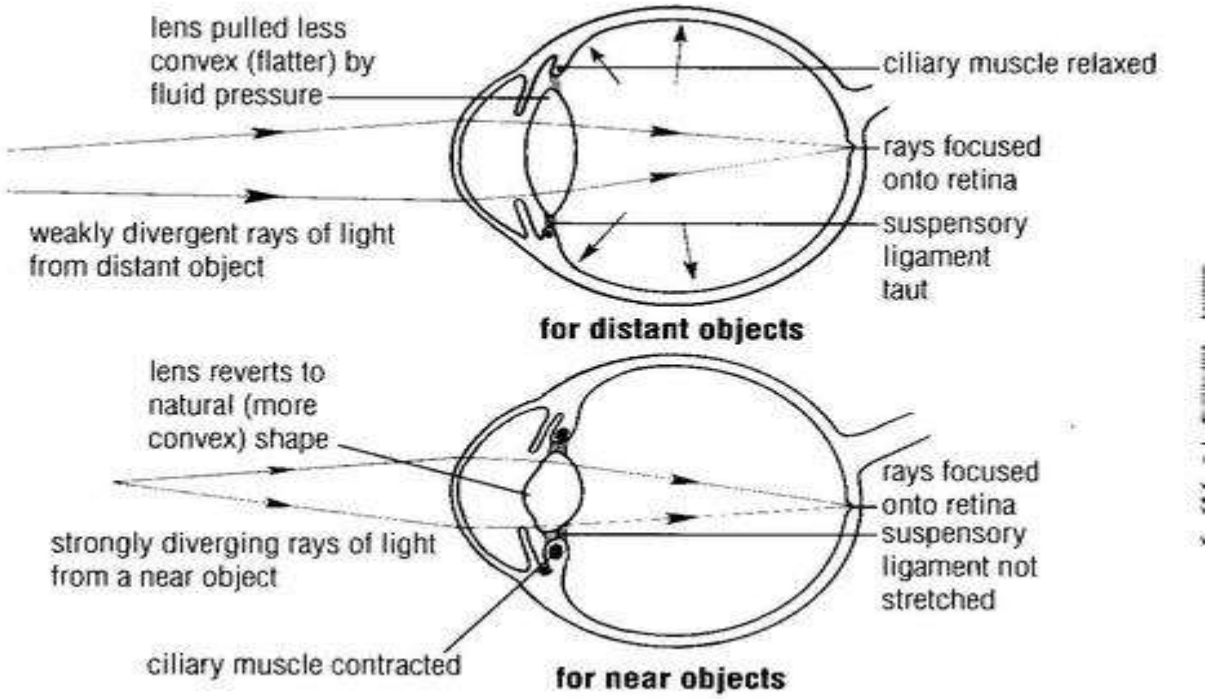
(b) Diabetes mellitus, caused by insufficient supply of insulin from the pancreas due to a damaged pancreas or due to liver damage preventing response to insulin.

(c) Medical treatment using insulin injections.

Item thirteen.

(a) Short sightedness, where near objects can be clearly focused on the retina but not distant objects. Images of distant objects are focused infront of the retina leading to blurred vision of far objects. This is caused by having an abnormally large/long eyeball or having abnormally strong lens/less elastic lens.

Illustration



(b) – Social neglect
- Hypertension
- Damage of the body organs e.g., liver, kidney hence death
- Loss of body weight
- Brain damage leading to hallucinations, lack of sleep etc

(c) – Going for counselling
- Avoid bad peer groups

- Going for medical rehabilitation
- Proper feeding.

Item fourteen.

(a) She had unprotected sex with her boyfriend. On ejaculation, sperms swam to her oviduct causing fertilisation of her ovulated egg from the ovary to form a zygote which was moved by the action of cilia along the oviduct to the uterus where implantation occurs to form a foetus. Hormonal changes e.g., increase in concentration of HCG caused many body changes e.g., vomiting.

(b) The effects of alcoholism and failure to go for antenatal care include;
- Difficult delivery
- Low weight of the baby at birth
- Affected intelligence of her baby at birth
- Ill health of her and her baby after birth
- Stress
- Family neglect
- Poverty
- STI infections

(c) -counselling
- Going for antenatal care
- Good feeding
- Leaving the bad company so she can stop drinking alcohol.

Item fifteen.

(a) Females have the genotype XX and produce ova carrying only X chromosomes yet males have the genotype XY and produce sperms which carry either X or Y chromosomes. The sex of the baby is determined by the nature of the sperm that fertilises the ovum i.e. when a sperm carrying the X chromosome fuses with an ovum carrying the X chromosome, a female with the genotype XX is formed. When a sperm carrying the Y chromosome fuses with an ovum carrying the X chromosome, a male with the genotype XY is formed.
So males who produce two forms of sperms determine the sex of the baby.
(A genetic cross is also allowed)

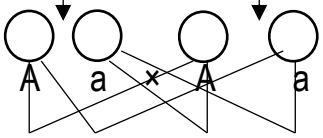
(b) – Slimming of the body
- Body sores
- Recurrent illness, etc

(c) – Going for medical treatment (ARVs)
- Feeding on a balanced diet
- Counselling
- Being faithful to your partner

Item sixteen

(a) Both Jane and her boyfriend are heterozygous/carriers of sickle cell anaemia.
Let A represent the allele for normal red cell
Let a represent the allele for sickle cell anaemia
Parental phenotypes: Normal/Carrier × Normal/Carrier

	woman		man
Parental genotypes:	Aa	×	Aa
Meiosis:			
Gametes:	A a	×	A a
Random fertilisation:			
Children's possible genotypes:	AA Aa	×	Aa aa
Children's possible phenotypes:	3 Normal children, 1 Sickler child		



(b) The effects of premature pregnancy include;
- Difficult delivery
- Inability to take care of needs of the baby
- School dropout
- Family neglect
- STI infection

– Going for counselling
- Resuming her studies after the baby is a little grown.

SCORE GUIDE FOR MOCK SET ONE 2024 ONE – OSMOSIS

ITEM 1

Competence 1: Aim of the experiment (A)

An experiment/investigation to determine the effect of concentrations solutions A and B on the tissues of specimen G.

Score 2: If the title is correct Score 1 If title is partially correct Score 0: If the title is incorrect or not written

Competence 2: Hypothesis (B)
One of the solutions of A or B has a very high concentration than the tissues of the plant.

Score 2: If the hypothesis is correctly stated Score 1: If hypothesis is partly correct Score 0: If hypothesis is incorrect or not written

Competence 3: Variables (C)

Controlled variables

- Length of tissue cylinders
- Volume of the solutions

Score 2: If 2 variables is stated correctly Score 1: If 1 variable is stated correctly Score 0: If no correct variable is given or wrong variable

Competence 4: List of apparatus/materials/ requirements (D)

- Cork borer
- Measuring cylinder
- Razor blade
- Test tubes or petri dishes
- Label papers
- Ruler
- Stop clock

Score 3: If all and only the relevant materials have been listed Score 2: If 1 irrelevant material has been mentioned among the relevant ones Score 1: If 2 or more irrelevant materials have been mentioned among the relevant ones Score 0: If only irrelevant materials mentioned or none mentioned.

Competence 5: Procedure (E1, E2, E3)

1. Using a cork borer, 2 tissue cylinders were made from specimen G.
2. Using a ruler and razor blade, the cylinders were cut to length 3cm each.
3. Two test tubes were each labelled A and B respectively.
4. 5 cm^3 of solutions A and B were each placed in the corresponding labelled test tube A and B.
5. One cylinder was dropped in each of the test tubes A and B and the set up left to stand for 20 minutes.
6. After 20 minutes, the cylinders were removed and their final length measured and any other changes on them observed.

E1

Score 2: If the procedure is completely relevant Score 1: If the procedure is partially relevant Score 0: If the procedure is irrelevant/wrong/not there

E2

Score 2: If the procedure is completely coherent

Score 1: If the procedure is partially coherent
Score 0: If the procedure is irrelevant/wrong

E3

Score 2: If all variables were completely managed
Score 1: If some variables are managed
Score 0: If no variable is managed

Competence 6: Observation and presentation of results (F1, F2)

Observation and results

	Initial length (cm)	Final length (cm)	Change in length (cm)	Texture
From solution A	3	3.2 - 3.4	0.2 – 0.4	Rough, hard
From solution B	3	2.6 – 2.9	-0.1 - -0.4	Soft, smooth

Note: Score if data presented in assay form instead of tabular

F1

Score 2: If observations are completely accurate
Score 1: If observations are partly accurate
Score 0: If observations are inaccurate/wrong

F2

Score 2: Data presented appropriately
Score 1: Data partly appropriate
Score 0: Data inappropriately presented

Competence 7: Explanation/interpretation of results (G)

When placed in solution A, the cylinder increased in length, became hard and rough. The solution A is hypotonic (has a lower solute concentration than the cells in the cylinder tissue), water moved by osmosis from solution A into the cells of the tissues causing the cells to swell and become turgid. This explains why some of Mercy's plants were upright and with strong stems.

When placed in solution B, the cylinders decreased in length, became smooth and soft. The solution B is hypertonic (has a higher solute concentration than the cells in the cylinder tissue), water moved by osmosis from the cells in the tissue to solution B causing the cells to shrink in size and become flaccid. This explains why some of Mercy's plants had there stems weak and bent.

Score 2: If explanation makes complete meaning
Score 1: If explanation makes partial meaning
Score 0: If explanation does not make meaning

Competence 7: Conclusion/recommendation/advice (H)

Mercy should only use the water from source A because it has low solute concentration and the

plant can absorb water from it. Score 2: If conclusion is relevant
Score 1: If conclusion is partly relevant
Score 0: If conclusion is wrong/irrelevant/not given

ITEM 2

Competence 1: Identification using observable features (A)
Specimen R, Q and T are vertebrae Reasons:

- They all have transverse processes
- They all have a neural canal
- They all have a neural spine
- They all have a centrum OR:

Uses dichotomous key

OR

Identifies each independently

Score 3: If gives at least 4 correct features or one from each
Score 2: If gives 2-3 correct features
Score 1: If gives only 1 correct feature

Competence 2: Adaptation to function/survival (B)

It has long neural spine for attachment of muscles that keep the cow upright

It strong and rigid to provide enough support to the cow without breaking easily It has a wide centrum providing a wide surface area for support

Score 2: if gives 2-3 adaptations
Score 1: if gives 1 adaptation
Score 0: if gives no adaptation or wrong adaptation

Competence 3: Drawing skills (C1)

******drawing of the thoracic vertebrae any view

Score 3: If all drawing skills are reflected (Title, neatness, magnification, outline)
Score 2: If half of drawing skills reflected
Score 1: If only one drawing skill reflected
Score 0: If no drawing skill is reflected

C2- labelling

Score 2: If all relevant parts labelled
Score 1: If only one part is labelled
Score 1: If all parts labelled are irrelevant or no label

Expected responses

AIM/TITLE; Experiment to compare the percentage of air in the soil samples L and M

HYPOTHESIS; soil sample L has more air than M/ soil sample M has more air than L

Apparatus: Measuring cylinders (2), dry soil samples L and M, water, and glass rod.

PROCEDURE;

1. Measure 100 cm^3 of dry soil sample L in a measuring cylinder and tap the container to level out the soil.
2. Measure 100 cm^3 of water in another measuring cylinder.
3. Add the two together (observe carefully as you pour the water onto the soil)
4. Allow the mixture to stand until no more bubbles appear.
5. Read and record the final level of water plus soil in the measuring cylinder.
6. Calculate the air content in terms of percentage.
7. Repeat the same procedures for dry soil sample M

Results

soil L

Volume of soil = 100cm^3

Volume of water = 100cm^3

Final volume of water + soil after mixing = ……..cm^3

Volume of air in soil (100 - …….) = …….cm^3

soil M

Volume of soil = 100cm^3

Volume of water = 100cm^3

Final volume of water + soil after mixing = ……..cm^3

Volume of air in soil (100 - ……) = …….cm^3

CONCLUSION

Soil sample L has more soil air compared to the soil sample M

RECOMMENDATION

I advise Namusisi to plant her ground nuts in the plot from which soil sample L was got because it has more air than soil sample M, which is needed by the plants. Having more air is also an implication that the soil sample has large particles and therefore better drainage

What other investigation can be done to solve this task?

a) X: cypsela: persistent calyx inform of pappus

dry indehiscent fruit: does not have of weakness.

Y: Capsule: has many lines of weakness (sutures)

Dry dehiscent fruit: dry pericarp with lines of weakness

b) Specimen X was able to spread all over the land because of its mode of dispersal.

It is small and light, has a pappus that help it to float in air and easily blown by air to all parts of the land.

Specimen Y was only found in specific places because its mode of dispersal is not as efficient as the one of specimen X.

It is has sutures, so it splits open to release its seeds, which does not move the offsprings very far from the mother plant.

c) The drawing should have:

A tittle, magnification, be neatly drawn. At least Epicarp / pericarp and Pappus / persistent calyx should be labelled.