GEYLANG METHODIST SCHOOL (SEC)
PRELIMINARY EXAM 2018
SEC 4E P BIOLOGY ANSWERS

PAPER 1

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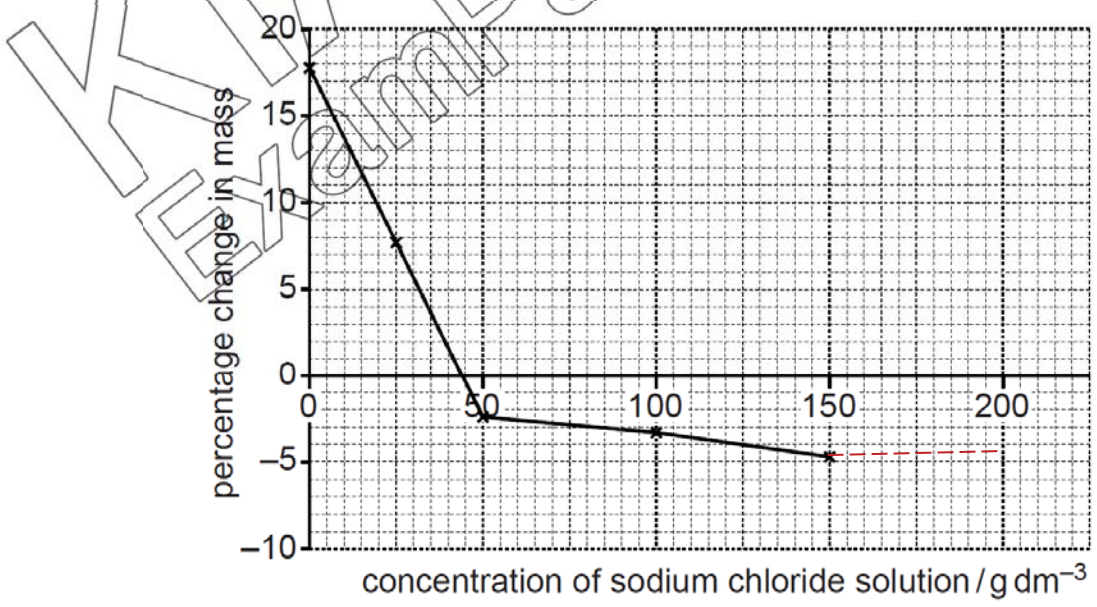
PAPER 2 Section A

1 (a) (i) - start mass of the onions is different / not all are the same [1];
- use of percentage change in mass allows for valid / fair comparison to determine water potential of the onion [1];

(ii) 183 – 175 = 8 ;

$\frac{8}{183} \times 100 = \underline{-4.4}$ [1];

(b) (i) line finished to – 4.4



(ii) 44 g dm^{-3};
with indication how value was obtained from graph [1]
otherwise 0 m

(c)

- movement of water by osmosis through partially permeable membrane(s) [1];
- When onion cell sap has lower water potential than sodium chloride solution / sodium chloride solution has higher water potential than onion cell sap, water enters the onion cells and causes the cells to swell and eventually gain in mass;

2 (a) (i) oesophagus [1]
(ii) peristalsis [1]

(b)
- The presence of food in H, stomach, stimulates the gastric glands to secrete gastric juice which contains hydrochloric acid and inactive pepsinogen. Hydrochloric serves to activate pepsinogen to pepsin [1].
- The mucus also serves to prevent corrosion by acid [1].
- The walls of stomach is coated with mucus to serve as a protection / barrier which prevents damage / breakdown by pepsin [1] on the stomach walls which are made of protein [1].
- The mucus also serves as lubrication during peristalsis in the stomach [1]

[max 4m]

(c) (i) The heart is not involved / no connection between E and the heart [1].

(ii) There are less mucus in E [1].
Acid from stomach damages the cells / walls of E [1].
The acid is neutralised by the alkaline nature of the medication [1].

3 (a) (i) **R** corpus luteum [1]
S (Grafiaan) follicle [1]

(ii) ovulation [1]

(b) (i) oestrogen [1]

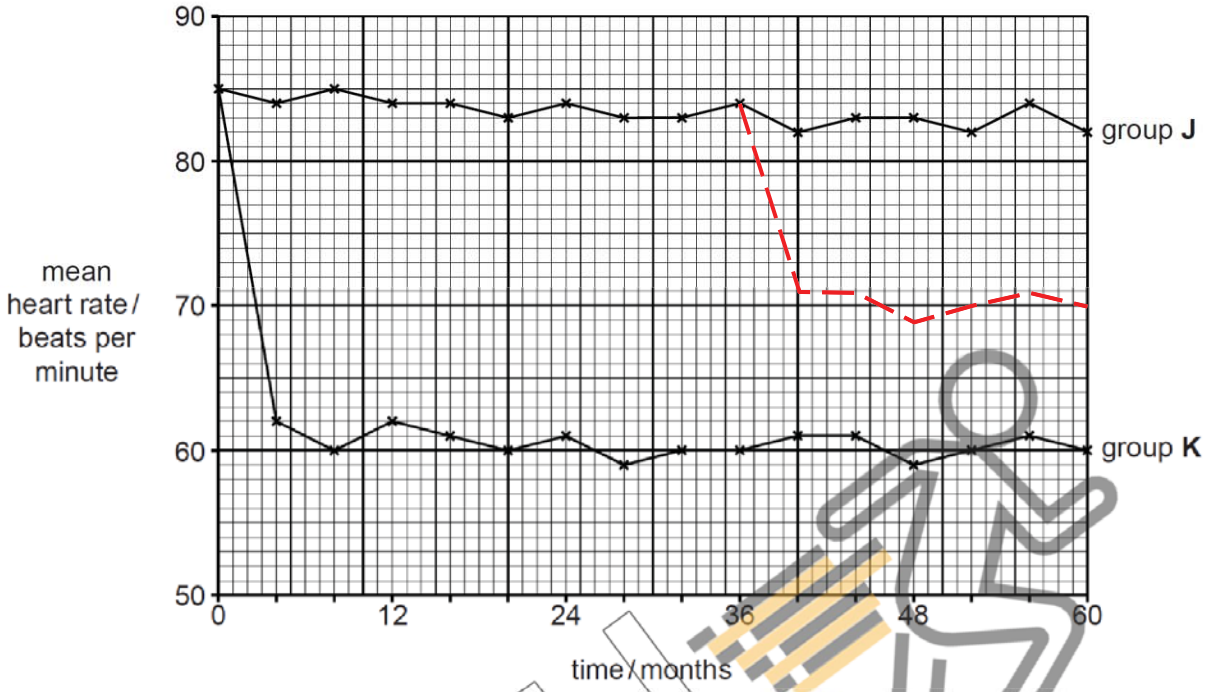
(ii) progesterone [1]

4 (a) (i) control

(ii) During the first four months, the heart rate decreases rapidly/ AW [1] from 85 to 62 beats per minute [use of data from Fig. 4.1 – 1m] .

The heart rate remains (more or less) constant between 59 – 62 beats per minute [1].

(b) line / curve starts at 36 months drops with similar gradient to line K [1];
to between 70 and 74 bpm [1];
levels to run parallel with the J and K [1];

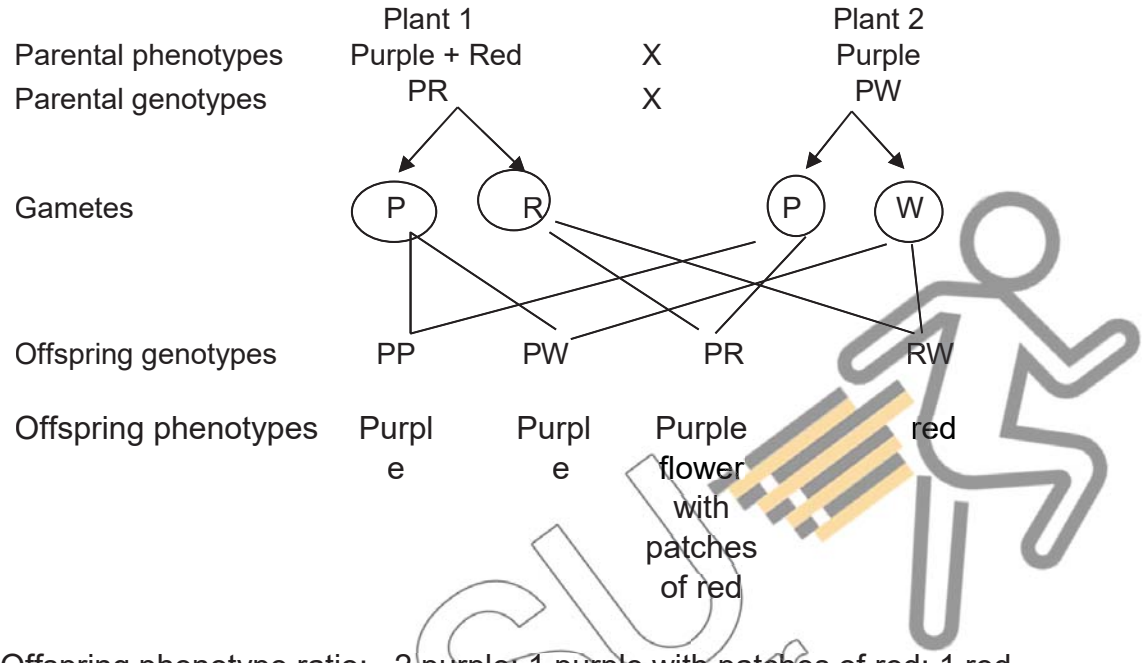


(c) prevent constriction of muscular wall in arteries / arterioles [1];
with larger lumens / dilation / widens / AW, reduces fats deposits;
OR
less resistance / friction / AW to blood flow. [1]

5 (a)

- Cross Plant 2 with a white flowered plant (test cross); [1]
- If all offspring have purple flowers, Plant 2 is homozygous; [1]
- If 50% of offspring have purple flowers and 50% of offspring have white flowers, plant 2 is heterozygous; [1]

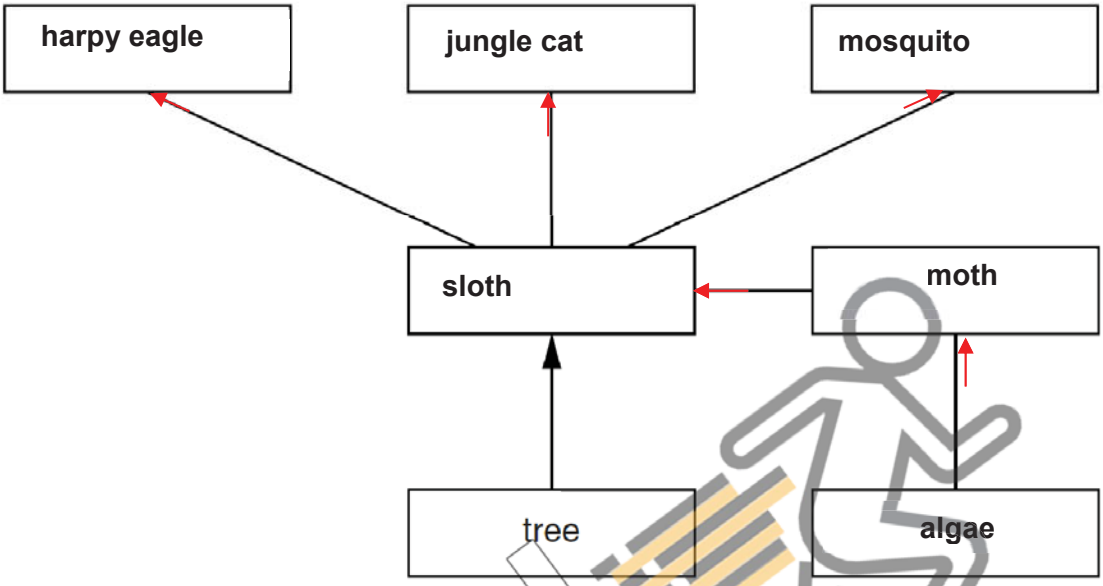
(b) Let the allele for purple flower be P, the allele for red flower be R and the allele for white flower be W.



Offspring phenotype ratio: 2 purple: 1 purple with patches of red: 1 red

Genetic diagram – 1m;
Phenotype ratio – 1m;
Correct genotype of plant 1 and 2 – 1m;
Correct crossing – 1m;

6 (a) top: harpy / eagle + (jungle) cat + mosquito [1];
middle: sloth (left) + moth (right) [1];
bottom: (tree) + algae [1];
any 4 arrow heads correct [1]; [total – 4m]



(b) camouflage / less easily seen ;
so not eaten / escape predators (or named) ;
slow moving / cannot escape quickly ; [max 2m]

7 (a)
- For flower D, the anther(s) / stamen(s) are visible.
- The pollen are matured / produced / present / released.
- The stigma is closed / immature AW / does not receive pollen.
- As for flower E, the stigma is open / mature / able to receive pollen.
- The anthers are withered AW OR reference to no pollen produced / present.

[max 3 – 3m]

(b) 1 large / colourful petal(s) present for bee landing/ platform on petal.
2 petals are scented to attract bees to visit the flower to help in pollination;
3 presence of nectar(ies) / (nectar) guides on petals to guide bees to the inside of flower;
4 The pollen is stick(y) / hooked so as to attach to bee;
5 The bee makes contact AW with anther / stigma while collecting nectar;
[any 4 – 4m]

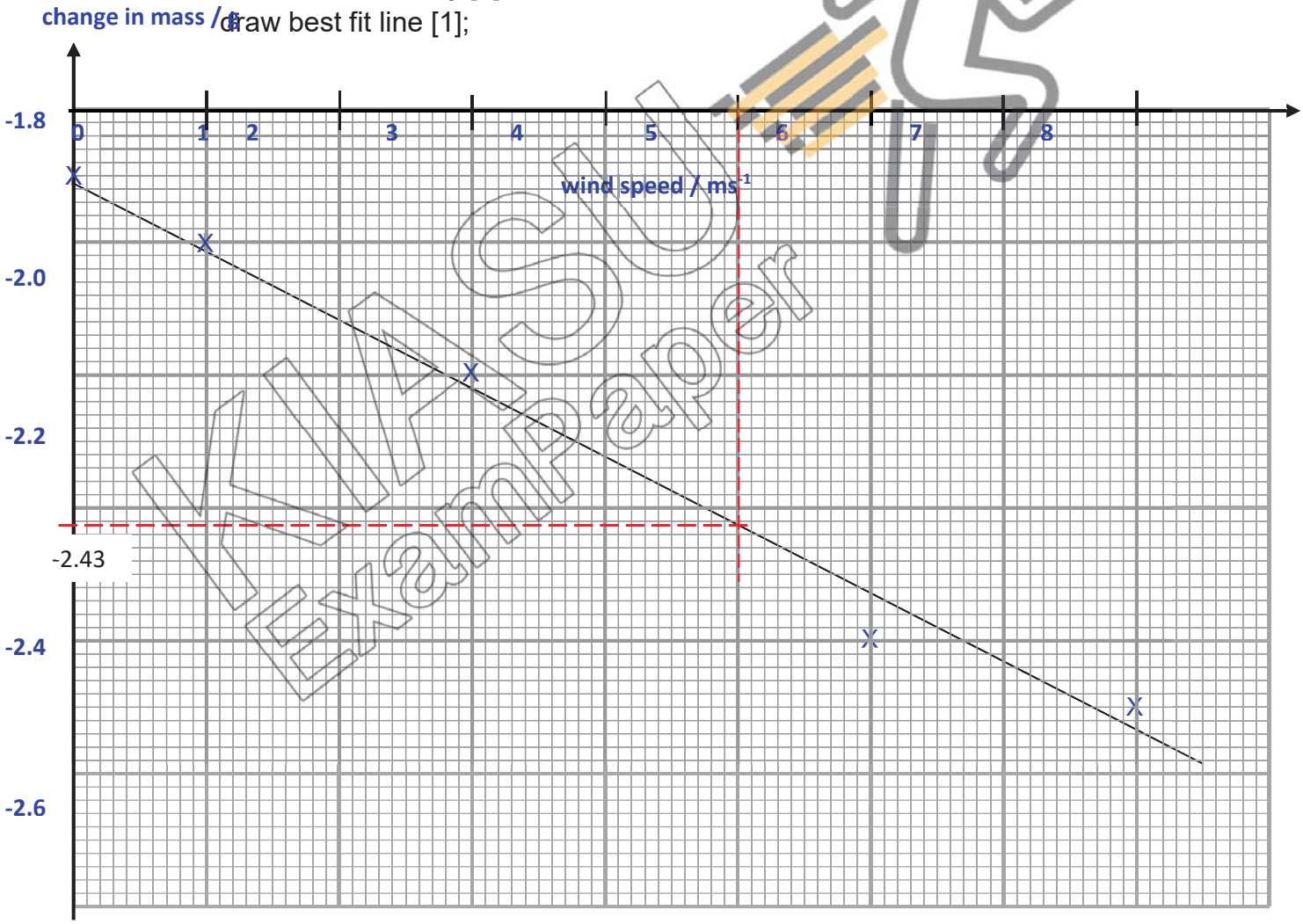
Section B

8 (a)

change in mass / g
3.8 – 5.7 = -1.9
3.3 – 5.3 = -2.0
3.7 – 5.9 = -2.2
2.6 – 5.1 = -2.5
2.6 – 5.3 = -2.7

- calculate correctly to 1dp [1];
- with negative sign to indicate loss in mass [1]

(b) axes labelled [1];
scales of x-and y-axes [1];
plot points correctly [1];
draw best fit line [1];



(c) [-2.43g] read from graph + correct units [1]

(d) As light intensity increases, the rate of water loss from the leaf increases [1].

This is because the size of stomata increase [1] with increased light intensity, leading to an increase in the rate of diffusion of water vapour out of the stomata [1].

(e) calculate the percentage change in mass [1] instead of absolute mass; as the original mass of the leaves are not the same [1];

9 (a)

- carbon dioxide uptake of batch J is higher than batch H (at all temperatures except at 10 °C);
- peak / optimum / maximum uptake of J is 35ºC and is of higher temperature than batch H which is 25ºC only;
- data recorded in J between 35 – 40ºC (but not for H);
  [correct use of comparative data between J and H with correct units, which must be stated at least once. Otherwise, 1m deducted]

(b)

- With the combustion of fossil fuels, high concentration of CO_2 is present in the environment.
- Plant growth is likely to increase due to higher rate of photosynthesis (with more carbon dioxides) resulting in more glucose / starch being produced.
- Glucose is used for respiration to provide energy (for growth) / more cellulose for cell walls / more protein for enzymes / cell membranes.
- Carbon dioxide is a greenhouse gas / reference to (enhanced) greenhouse effect. This causes increase in global temperatures and increased rate of photosynthesis.
- As enzymes are involved in photosynthesis, increase in temperature affects enzyme activity / cause denaturation of enzymes.
- In the long run, rate of photosynthesis will slow down.
- any relevant consequence of global warming ;
- Any other valid point; e.g. relevant use of data
  [max 5]

10E (a) ref. in either (a) or (b) to reflex action [1]; neurones/ impulses [1]

When the person looks up to see the aeroplane, his ciliary muscles relax [1].
This causes the suspensory ligaments to tighten [1], resulting in the lens being pulled [1] and become thinner / longer focal length /AW [1].
This reflex action [1] enables him to focus on the distant object [1].
[max. 6]

(b) When the person turns from reading book in the shade to looking at the aeroplane in brighter light [1], the retina detected the change in light intensity.
An impulse is sent to the circular muscles in iris to contract, radial muscles to relax [1]. Thus, the pupil becomes smaller [1];
[max. 4*]
[*to include either of the first two marking points]

10O (a) Mucus is secreted by the gland cells to tranp dust particles and bacteria [1].

The cilia on the epithelial cells in trachea sweeps / moves up dust-trapped mucus up the trachea away from lungs [1].

Thus, preventing infection of the lungs [1].

(b) reference to diffusion of oxygen / carbon dioxide + exchange AW [1];

The alveolus / air sac has large surface area [1].

Both the alveolus and blood capillary have a one cell thick wall [1] which allows for faster diffusion of oxygen and carbon dioxide [1].

There is a layer of moisture lining the alveolar wall for dissolving gases before being diffused across the walls of alveolus to capillary wall [1].

The red blood cells / erythrocytes has no nucleus. This gives it a biconcave shape which increase surface area to volume ratio for exchange of oxygen into and out of the cells. [1]

Red blood cells contain haemoglobin which combine with oxygen to become oxyhaemoglobin. It is being transported to oxygen poor cells and oxygen is then released from haemoglobin and diffused into the cells [1].

Carbon dioxide is being transported in the plasma in the form of hydrogen carbonate ions. When it reaches the lungs, the hydrogen carbonate ions diffuses into the red blood cells where they are converted into carbonic acid and then into water and carbon dioxide. Carbon dioxide then diffuses out of the red blood cells, out of the blood capillary and into the alveoli, where it is expelled when breathing out [1].

[max 7m]