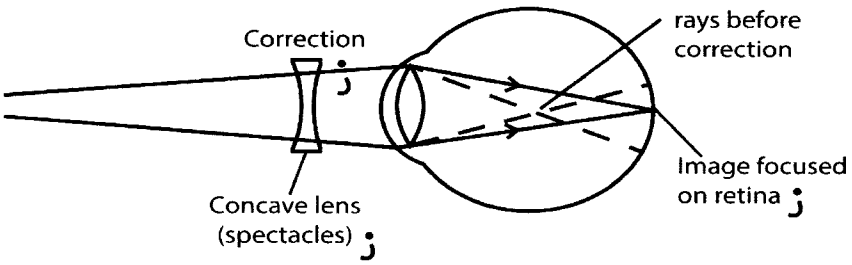
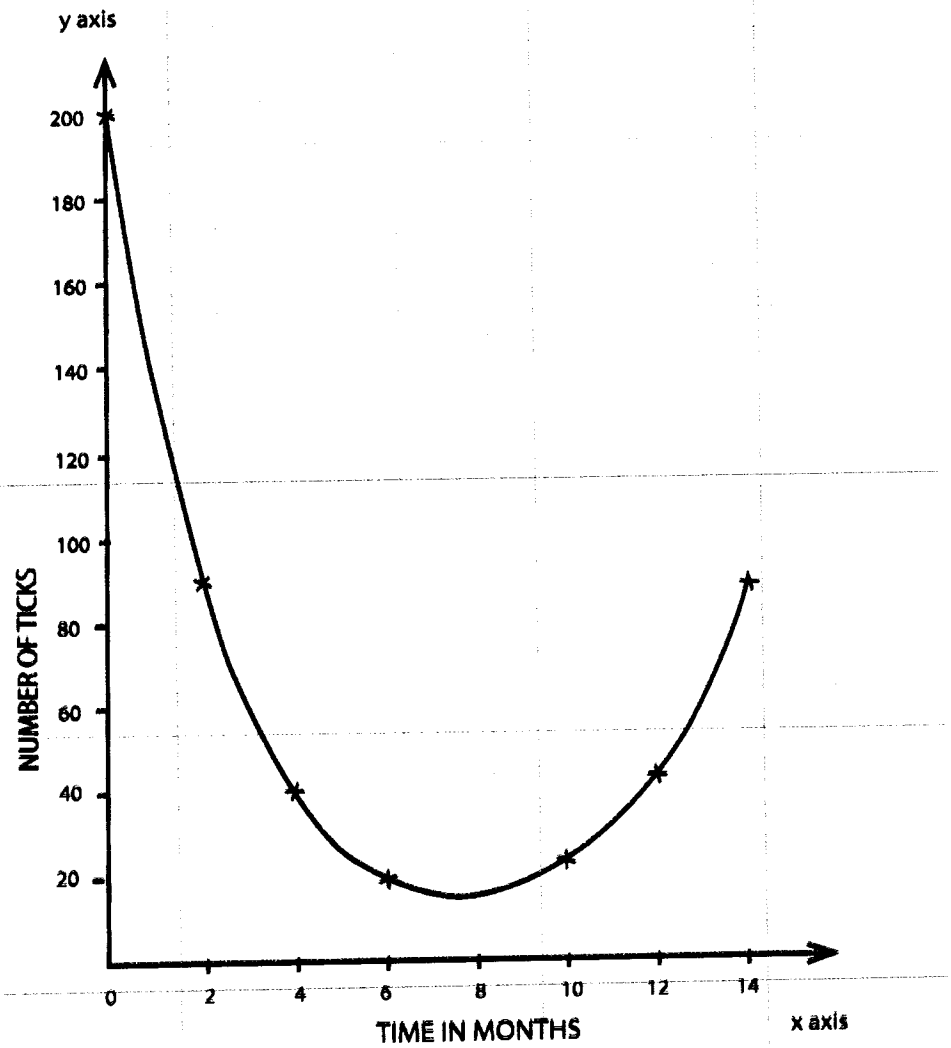
4.5.2 Biology Paper 2 (231/2)

1. (a)	(i) Uric acid; (ii) The organism is terrestrial, a habitat that has insufficient water, uric acid requires less water to eliminate/removal of uric acid thus conserves water/less poisonous/less toxic;	(1 mark) (1 mark)
(b)	The organism is an ectotherm; OWTTE	(1 mark)
(c)	(i) Organism **F**; (ii) Organism **F** is eaten by **E**, hence occupies a lower trophic level. Biomass/energy decreases up the trophic level;	(1 mark) (1 mark)
(d)	• It is dorsal – ventrally flattened, hence able to move through/penetrate crevices (in search of food, mates, for safety); • Has (a pair of) wings to fly (for food/safety); • Has a pair of antennae for sensory purposes (for safety); • Has exoskeleton/cuticle for protection/conservation of water; • Has (laterally positioned) legs to enable it move;	(3 marks)
2. a)	Klinefelter's syndrome;	(1 mark)
b)	Chromosomal abnormalities/mutations; result in the addition of a whole chromosome; it occurs during the ($1^{st}/2^{nd}$ meiosis/meiotic division, where the homologous chromosomes/sister chromatids fail to segregate; (and so) move to the same gamete cell; if the gamete with **XX** fuses with a gamete with **Y**, the offspring becomes **XXY;** (Any 4 marks)	(4 marks)
c)	(i) It prevents spindle formation during cell division thus leading to a cell with extra sets of chromosomes; (ii) (Results in the production of varieties with advantageous traits, that is), • Resistant to drought/pests/diseases; • High yields; • Early maturity; (Any 2)	(1 mark) (2 marks)
3. a)	i. There was no germination; due to (very) low temperature; which inactivated enzymes;	(3 marks)
	ii. Percentage germination was highest; temperature was (most) favourable/optimum (for germination); enzymes worked at their best/were activated;	(3 marks)
b)	• (Immature) embryo; • (Presence of) hard seed coat; • (Absence of/inadequate) growth hormones; • Enzyme inhibitors; • Viability;	(2 marks)
4. a)	Short sightedness/myopia/near-sightedness;	(1 mark)

b)	Has a long eye ball; resulting in the light rays from the colleague (student) who is 12m away being focused at a point in front of the retina (thus appearing blurred); Light rays from the book are focused on the retina;(by bringing the book closer to the eyes).	(3 marks)
c)		(3 marks)
d)	Vitamins **A**/Retinol;	(1 mark)
5. a) i	Blood entering lungs has a lower concentration of oxygen and high(er) concentration of carbon (IV) oxide; since most of the oxygen had been used (up in the tissues) during respiration; yielding (more) carbon (IV) oxide;	(2 marks)
ii	Blood leaving the lungs has a lower concentration of carbon (IV) oxide and higher concentration of oxygen; since it has been purified; (a lot of the carbon (IV) oxide is released into the alveolar cavity as it 'picks' some oxygen from the alveolar air). The volume of nitrogen remains unchanged (in the in-coming or exiting blood) as it is not used up in (tissue) respiration;	(2 marks)
b)	Pulmonary artery;	(1 mark)
c)	High altitude areas have low oxygen concentration; the body produces more red blood cells; which carry more oxygen to the tissues for respiration; producing more energy for the athlete;	(3 marks)

6. a)

AVERAGE NUMBER OF TICKS PER ANIMAL AGAINST TIME IN MONTHS



Smooth curve- 1 mark
Correct scale – 2 marks
Plotting (all points) – 1 mark
Labelling axes appropriately – 2 marks **(6 marks)**

b)	(i) (Rapid) decrease in the number of ticks; chemical was poisonous/kill the ticks; ticks had not adapted to the chemical/had not developed resistance;	(3 marks)
	(ii) The number of ticks per animal increased; ticks had (gradually) adapted to the chemical/ developed resistance; resistant ticks produced enzymes that made the chemical harmless to them;	(3marks)
c)	28 ticks;±2	(1 mark)

d)	Grass → animal → tick → bird → vulture Accept correct/specific names of organisms in the food chain eg, cow/ goat (for animal), ox pecker/chicken/cattle egret/turkey/guinea fowl;	(4 marks)
e)	• Estimation by mapping based on the various parts of the animal's body; • Physical counting; • Sampling the animals;	(3 marks)
7. a)	When blood glucose level is high, insulin hormone is produced; by the pancreas; stimulating liver cells to convert excess glucose to glycogen (for storage)/some excess glucose is also converted to fats; When blood glucose level is low glucagon hormone is secreted; by the pancreas (into the blood-stream), stimulating liver cells to convert the (stored) glycogen/fats to glucose, (restoring the normal blood glucose level); Max. 3 marks	(3 marks)
b)	Human blood has various components that enable it effectively perform its functions. Plasma; is the fluid part of blood, consisting of dissolved and undissolved substances; the plasma acts as a medium in which various substances are transported in the body; it acts as a medium in which various metabolic reactions occur; plays a role in thermoregulation/distributes heat; Platelets; contain proteins; that help in blood clotting (when blood is exposed); preventing loss of blood/ anaemia; also prevents entry of pathogens; White blood cells; are irregular/amoebid in shape; they protect the body against attack by pathogens; by engulfing them; and releasing (various) antibodies against the pathogens; they are numerous to enhance the body defense mechanism; Red blood cells; are biconcave in shape; to increase surface area for diffusion of gases/squeeze through blood capillaries; they lack the nucleus; to allow for packing of more haemoglobin; has haemoglobin that has a high affinity for oxygen; they are also numerous; to increase the surface area to transport more oxygen;	(17 marks)

8. (a)	Chloroplasts are sites of photosynthesis; during the day photosynthesis takes place; glucose is manufactured; glucose being osmotically active, increases the internal concentration of the guard cells; water is drawn into the guard cells (from the adjacent epidermal cells);guard cells become turgid; bulging outwards; unequal expansion of the guard cells results in the opening of the stomata; Chloroplasts are sites of photosynthesis; during the day photosynthesis takes place; using up carbon (IV) oxide, raising the pH of the guard cells that favours conversion of starch to glucose; Chloroplasts are sites of photosynthesis; during the day photosynthesis takes place; ATP accumulates in guard cells making the guard cells to draw/take up potassium ions(K^+) (from adjacent epidermal cells) osmotic pressure of the guard cells increase;	(5 marks)
(b)	Carbon (IV) oxide concentration; carbon (IV) oxide is a raw material for photosynthesis; an increase of carbon (IV) oxide (beyond 0.04%) leads to an increase in the rate of photosynthesis; up to a given optimum; beyond the optimum the rate of photosynthesis remains constant; due to other limiting factors; Light intensity/quality of light; light provides the initial energy required for photosynthesis /light stage/photolysis; the rate of photosynthesis increases as light intensity increases; up to an optimum level; beyond the optimum the rate of photosynthesis remains constant; due to other limiting factors; at very high light intensity, chlorophyll; is damaged/ bleached; and the rate of photosynthesis drops; Temperature; very low temperatures inactivate enzymes thus reducing the rate of photosynthesis; as temperature increases, the rate of photosynthesis increases; up to optimum temperature; temperature above optimum denatures enzymes; reducing the rate of photosynthesis; Water; is a raw material for photosynthesis; it also influences (the rate of photosynthesis by affecting other processes like) opening and closure of stomata which in turn affect the diffusion of carbon (IV) oxide into the leaf, (further affecting the rate of photosynthesis);	(15 marks)