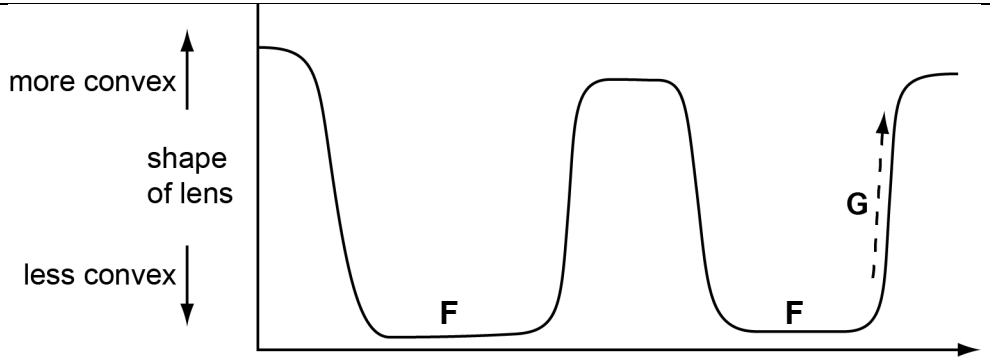
DUNMAN SECONDARY SCHOOL
PRELIMINARY EXAMINATION 2024 - SECONDARY 4 EXPRESS
BIOLOGY 6093 (MARKING SCHEME)

Paper 1

1	2	3	4	5	6	7	8	9	10
D	**B**	**C**	**B**	**A**	**A**	**B**	**C**	**A**	**B**
11	12	13	14	15	16	17	18	19	20
B	**A**	**C**	**A**	**B**	**D**	**C**	**D**	**A**	**C**
21	22	23	24	25	26	27	28	29	30
D	**B**	**A**	**D**	**C**	**C**	**B**	**A**	**B**	**B**
31	32	33	34	35	36	37	38	39	40
D	**C**	**A**	**D**	**B**	**C**	**A**	**C**	**C**	**B**

Paper 2

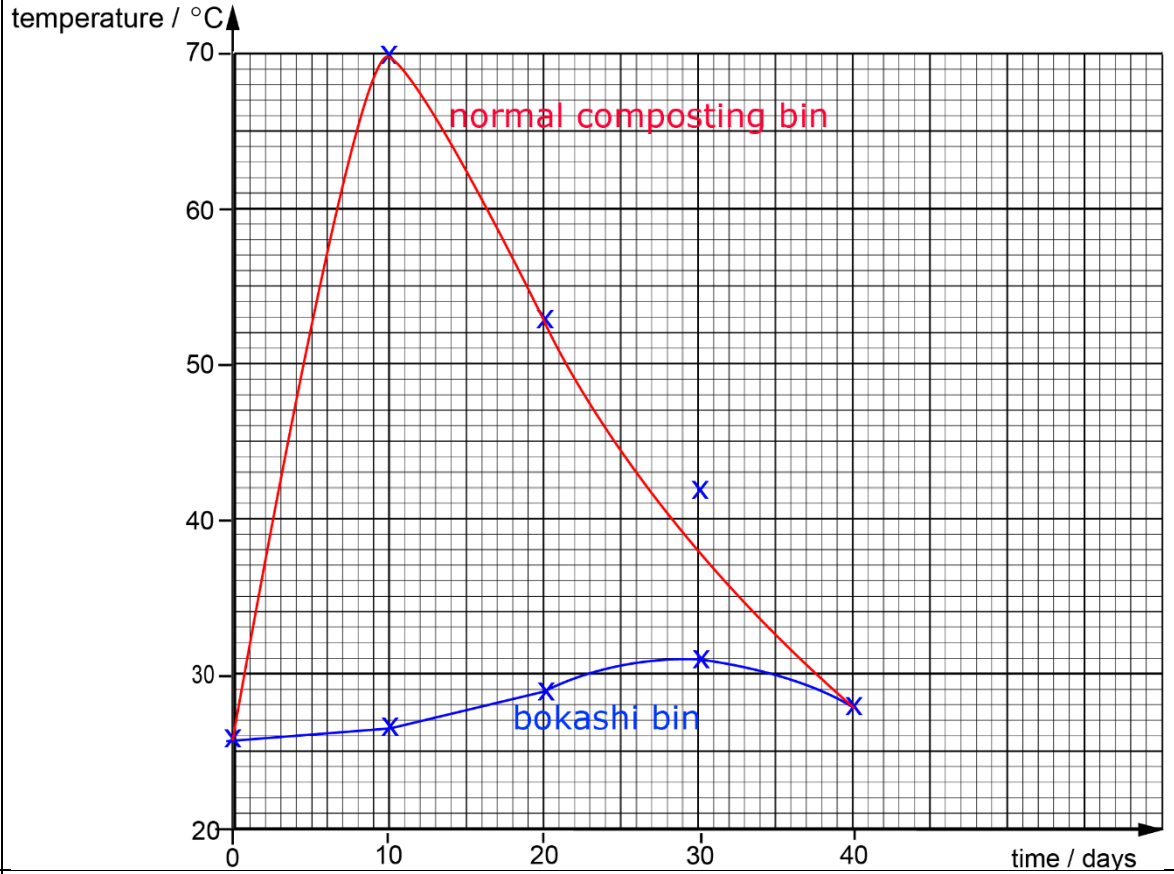
Question			Marking scheme
1	(a)		**A :** rough endoplasmic reticulum / (Reject rER) [1] function: Transports proteins made by the ribosomes to the Golgi body / Site of protein synthesis [1]
	(b)		water potential of cell increases [1] and becomes higher than the water potential in the lumen of the small intestine [1] with the secretion of ion X water moves out of the cell down a water potential gradient [1] across the partially permeable membrane by osmosis [1]
	(c)	(i)	The vaccine contains antigens / part of the pathogen/ weakened form of the pathogen/cholera bacteria [1] The vaccine stimulates the white blood cells to produce antibodies quickly to destroy the pathogen before they infect the body cells. [1]
		(ii)	- wash hands with soap and water before handling food [1] - drink boiled water/ bottled drinking water [1]

			Accept any logical answers
2	(a)	(i)	**D**: retina [1] **E**: fovea / yellow spot [1]
		(ii)	Any 3: transport glucose / amino acids / minerals / vitamins for growth and repair of cells [1] transport oxygen and glucose for (aerobic) respiration [1] transport urea / carbon dioxide away from cells by diffusion [1] capillaries transports blood with white blood cells to fight infection [1]
	(b)	(i)	 Accept either time [1]
		(ii)	Ciliary muscles contract, relaxing their pull on the suspensory ligaments [1] Suspensory ligaments slacken, relaxing their pull on the elastic lens [1]
	(c)		Box 1: sensory / afferent neurone Box 2: motor / efferent neurone /fibre Box 3: effector / muscle / gland / A named effector 3 correct = 2 marks 1 or 2 correct = 1 mark
3	(a)		Dominant allele is one of the different forms of a gene that expresses itself and gives the same phenotype in both the homozygous and heterozygous condition. [1]

	(b)	(i)	father x mother genotypes of parents ……Hh…… ……hh…… gametes ….H…. ….h…. ….h…. ….h…. genotypes of offspring … Hh …. … Hh …. … hh …. … hh …. [1] for each correct row of answers
		(ii)	2/4 x 100% = 50% [1]
	(c)	(i)	HH, Hh [1]
		(ii)	1 and 2 with HD having child 5 without HD [1]
	(d)		Ribosome cannot attach and move along the mRNA that is bound to the drug [1] OR bound mRNA cannot be used to synthesise proteins [1] by ribosomes [1] Less mRNA to synthesise polypeptide of huntingtin protein [1] Less huntingtin protein to cause damage to nerve cells [1]
4	(a)	(i)	Photosynthesis
		(ii)	it stops the process/photosynthesis and no oxygen is produced [1] algal balls are more dense [1]
	(b)	(i)	With light, sharp increase in height, moss ball floats at highest height of 50 arbitrary units [1] Aft 12 hours, no light, it sinks to 5 arbitrary units;
		(ii)	In experiment 1, rate of Respiration is more than the rate of photosynthesis using up the oxygen after 12 h [1] In experiment 2, an increase in duration of light exposure, the higher the rate of photosynthesis /release oxygen which makes the ball float for a longer period of time beyond 12 h. [1]

	(c)		An increase in temperature to the optimum temperature can increase the rate of photosynthesis [1] as it is an enzyme-catalysed reaction [1] Beyond the optimum temperature, the rate of photosynthesis can decrease as the enzymes denature [1] The rate of transpiration increases as the evaporation of water from the spongy mesophyll cells into the intercellular air space and out of the leaf through the stomata increases [1] Any three
5	(a)		Any two coral / algae, are producers so less energy (enters the food web) / AW [1] less substrate for algae to grow on [1] (fewer parrotfish because) parrotfish lose a food source [1] fewer damselfish, due to lack of shelter / protection (from coral) / less algae [1] fewer lionfish, as reef shark eat more lionfish / fewer damselfish for lionfish to eat [1] fewer sharks due to, fewer parrotfish / fewer lionfish, (to eat) [1]
	(b)		any two: shows actual energy transfer so allows comparison of food chains [1] not all biomass of organisms have the same energy content so comparison of food chain is not accurate [1]
	(c)	(i)	Harmful chemicals from plastics may be leached into oceans and poison wildlife in the ocean [1] Harmful to marine organisms/ e.g., turtles, fish that eat them Microplastic ingested by marine organisms can accumulate in their bodies and lead to biomagnification along the food chain [1]
		(ii)	Carbon dioxide is a greenhouse gas that can cause global warming [1] Rise in seawater temperature may result in a loss of biodiversity [1] More atmospheric carbon dioxide dissolving in sea water makes it more acidic which can dissolve the calcium compound in the shells of shellfish and make the shell weak and the shellfish more vulnerable to predators [1]
6	(a)	(i)	- it supports and cushions the fetus before birth - it is a shock absorber

			- it cannot be compressed, it protects the fetus against physical injury - it allows the fetus a certain degree of movement which promotes muscular development - during birth, it lubricates and reduces friction in the vagina or birth canal Any 2 points
		(ii)	Progesterone or Oestrogen
	(b)	(i)	13% x 1 000 000 [1] = 130 000 [1]
		(ii)	nicotine, drug **X**, Rubella virus, *Vibrio cholera* [1]
	(c)		The placenta is <u>like the lungs</u> as it allows the <u>transport of oxygen from the mother's blood to the fetal blood [1]</u> and <u>carbon dioxide from the fetal blood to the mother's blood</u>. [1] The placenta is <u>like the kidney</u> as it allows <u>transport of urea / nitrogenous waste [1] from the fetal blood to the mother's blood</u>. [1]
7	(a)		Holes in normal composting bin allow more oxygen to enter so that aerobic respiration of bacteria can occur [1] Lack of holes in bokashi bin does not allow oxygen to enter therefore anaerobic respiration of bacteria can occur when the oxygen in the bin is used up. [1]

	(b)	(i)	 Correct scale such that graph occupies at least half of the grid space [1] Best-fit lines labelled or with a key [1] Axes with correct units [1] Plot all data points correctly [1]
		(ii)	Any two: Temperature increases from 26°C to 70°C for first 10 days as the bacteria release heat / energy from respiration. [1] The temperature decreases after 10 days as the rate of aerobic respiration of bacteria decreases / decomposition slows down.[1] Accept temperature starts to drop as enzymes involved in respiration denature beyond the optimal temperature of the enzyme. [1]
		(iii)	Aerobic respiration of bacteria in normal composting bin releases more heat compared to anaerobic respiration of the bacteria in the bokashi bin [1] ORA Rate of respiration in normal bin occurs faster in normal composting bin than in bokashi bin [1] ORA

8	(a)		The distribution of armour plates among the fish are in groups that are easily distinguishable without any intermediate forms [1] A: distinct / clear-cut phenotypes
	(b)		% with low plates decreases from 1957 to 2005 [1] % with many plates increases from 1957 to 2005 [1] from 1957 to 1975, % with medium plates increases [1] from 1975 to 2005, % with medium plates remains constant [1]
	(c)		variation of individuals with more armour plate distribution in the population can be due to random mutation [1] fish with more plates survive [1] as more plates protects fish and results in less predation / ORA [1] reproduction of surviving fish with more armour plates produce offspring / produce next generation [1] pass on allele for many plates to the offspring [1]
	9(a)		**Q /** pathogen, have specific / unique antigen that is complementary to antibodies [1] **S** / lymphocyte produces antibodies [1] **T** / antibodies bind to, antigen / pathogen [1] to cause clumping or agglutination [1] **R /** phagocytes, engulf, pathogens / antigens [1] **R /** phagocytes, have enzymes / digest pathogens OR antigens [1]
	9(b)		*support of conclusion:* general decrease, from 1942 / vaccination [1] cases do not return to pre-vaccine levels / AW [1] no cases from 1974 [1] *against conclusion (max 3):* number of cases increased, (during the 2 years) after the vaccine was introduced / until government made its conclusion [1] took 32 years after vaccine introduced before no cases of disease [1]

			but there are (small) peaks (in cases) / fluctuation (in cases) [1] comparative data quote [1] Any 4 points

Abbreviations, annotations and conventions used in the detailed Mark Scheme

[1]	separates marking points
/	alternative and acceptable answers for the marking point
Reject	answers which are not credit worthy
Accept	answers that can be accepted
__	Underlined words must be present in answer to score a mark
ECF	Error carried forward
ORA	Or reverse argument