6093 Biology Yearly TYS 2020

No	**Paper 1**	Marks	Remarks
1		1	
2		1	
3		1	
4		1	
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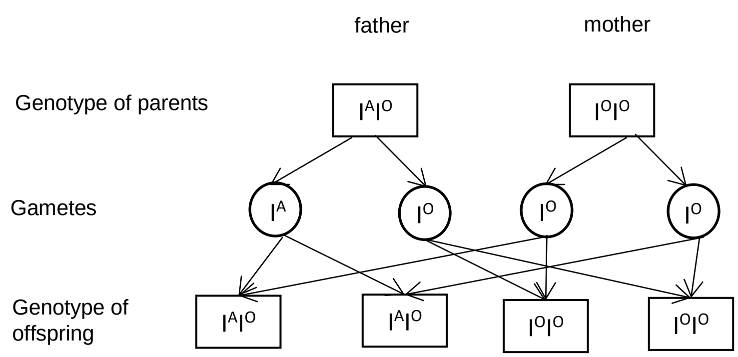
32		1	
33		1	
34		1	
35		1	
36		1	
37		1	
38		1	
39		1	
40		1	
	Total	40	

	Paper 2		
	Section A		
1a	A: ovary B: oviduct/ fallopian tube C: cervix	1 1 1	
1b	X on one of the oviduct nearer to an ovary	1	
1c	Fertilised egg becomes a zygote + cilia sweep the zygote along oviduct + peristaltic movements help to move zygote along the oviduct to the uterus; Zygote divides by mitosis to form embryo + embryo embeds/implants itself in the uterine lining seven days after fertilisation; Amniotic sac begins to develop + encloses the embryo in the amniotic cavity containing amniotic fluid/ villi containing blood capillaries of embryo grow from embryo into the uterine wall making up a placenta + umbilical cord attaches embryo to placenta;	1 1 1	 formation of amniotic sac/fluid or placenta
1di	sweep the zygote along oviduct	1	
1dii	respiratory system	1	
	Total	9	

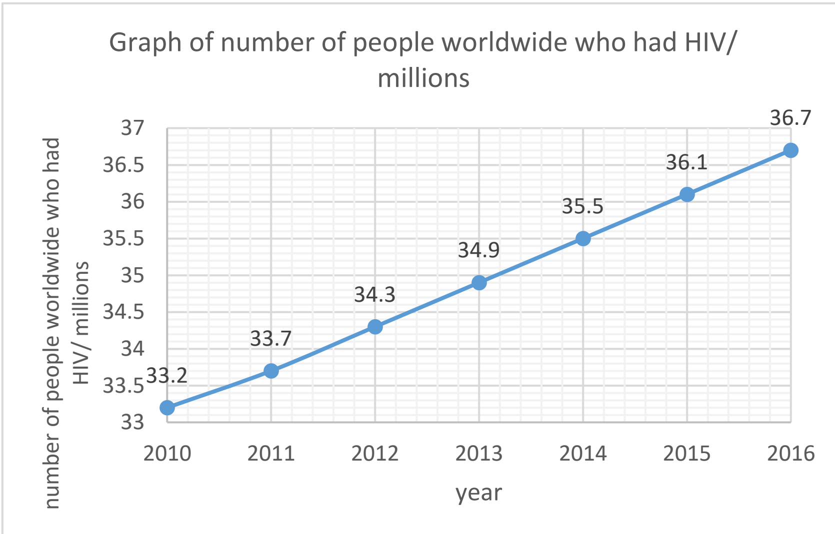
2a	D: interphase + each chromatin thread undergoing DNA replication, resulting in a pair of sister chromatids, causing the mass of DNA to double from 8 a.u. to 16 a.u.; E: cytokinesis + division of cell to produce two identical daughter cells each containing the same number of chromatin threads causing mass of DNA to decrease to 8 a.u.;	1 1	
2bi	anaphase	1	
2bii	before: metaphase after: telophase	1 1	
2biii	haploid number: 3 explanation: gametes are haploid means they contain half the number of chromosomes as normal plant cells produced when cells in the ovary or pollen grain/gonads undergo meiosis; 6 chromosomes will result in 3 homologous chromosomes + after meiosis, each daughter cell will contain 3 daughter chromosomes;	1 1 1	
2c	Homologous chromosomes may cross over in prophase I of meiosis + exchange of genes between the paternal and maternal chromosome producing new combinations of genes along the chromosomes which leads to genetic variation; Random arrangement of chromosomes in metaphase I in meiosis + chromosome randomly line up + random separation of homologous chromosomes at anaphase I + independent assortment of chromosome + producing different combinations of genetic material in gametes + increasing genetic variation; Random fertlisation + nuclues of any sperm fuses with nucleus of any egg + producing offspring of different combination of genotypes + can lead to genetic variation;	1 1 1	
	Total	11	

3a		1 1 1	
3b	codominance results when the two alleles controlling a trait both express themselves in the organism; multiple alleles is a term used for a gene that exists in more than two alleles for a given trait; human blood group, A, B, AB and O are determined by three alleles, I^A, I^B and I^O + a person can have any two of the alleles but not all three + I^A and I^B exhibit co-dominance and are dominant over I^O + individuals with alleles I^A and I^B will have AB blood group;	1 1 1	
3c	discontinuous variation is difference in traits between individuals of the same species + which is controlled by one or a few genes / that show clear-cut phenotypes with no intermediate forms/ which is easily distinguishable and are not affected by environmental conditions	1	
3d	a gene is a unit of inheritance, born on a particular locus of a chromosome + small segment of DNA in a chromosome that controls a particular characteristic or protein in an organism; Alleles are different forms of the same gene that occupy the same relative positions (locus) on a pair of homologous chromosomes;	1 1	
	Total	9	

4a	The younger the age men starts to smoke regularly, the higher the chances of dying when they reach ages between 40 to 60 years old; men who started regular smoking at age 10 to 14 years old has a higher death rate of 2 a.u. compared to men who started regular smoking at 25 to 29 years old whose death rate is at 1.25 a.u.; when men start to smoke regularly at a young age, the effect of tobacco smoke can occur earlier in their life + frequent exposure to tobacco smoke may increase the risk of lung diseases such as chronic bronchitis, emphysema and lung cancer + eventually increase risk of death at ages 40 to 60;	1 1 1	
4b	occlusion (blockage) of coronary arteries greatly reduce the blood supply to the heart muscles + eventually blood flow is blocked + causing heart attack; causing reduce/no supply of oxygen and nutrients such as glucose to heart muscles/ heart muscles do not receive enough oxygen and nutrients; heart muscles die + extensive heart muscle damage is fatal as the heart is no longer able to pump blood to the various part of the body;	1 1 1	
4c	mothers who smoke may develop occlusion in their blood vessels + reducing blood supply to the placenta; causing reduced supply of oxygen and nutrients to the placenta + fetus does not receive enough nutrients; lacking of proteins and fats for the building of protoplasm and new cells + leading to low body mass of babies;	1 1 1	
	Total	9	

5a	40.00 ÷ 0.04 = 1000	1	
5b	chemicals in insecticides are cannot be broken down by microorganisms/ bacteria + when consumed, cannot be excreted but stored in fatty tissues of organisms who consume food that contains the chemicals; bioaccumulation + chemicals accumulate in the bodies of primary consumer (small fishes) transferred to secondary consumer (large fishes) and eventually tertiary consumers (fish-eating birds) through feeding; bioamplification + increase in the concentration of chemicals as you move up the food chain + higher proportion of fish-eating birds (top of food chain) died compared to other consumers in the food chain;	1 1 1	
5c	number of large fishes increases rapidly due to the absence of a predator (fish-eating birds); number of small fishes decreases as the increased number of large fishes results in increase feeding/ consumption of small fishes;	1 1 1	
	Total	7	

6ai	thick elastic layer of arteries is needed to withstand the high blood pressure in the artery; elasticity enables the artery wall to stretch and recoil/ spring back, pushing the blood in spurts, preventing damage/ bursting of blood vessel;	1 1	
6aii	contraction and relaxation of muscle fibres in the arterial wall bring about constriction and dilation of the artery; when artery constricts, lumen becomes narrower and less blood flows through per unit time/ when artery dilates, lumen becomes wider and more blood flows through it per unit time;	1 1	
6b	valves/ internal valves/ semi-lunar valves	1	
	Total	5	

<table>
<tr><td></td><td>Section B</td><td></td><td></td></tr>
<tr><td>7ai</td><td>

Axes labelled + all ticks labelled at equal intervals;
Best fit line + no shading + smooth curve;
All points plotted accurately;
Maximise the size of grid provided;</td><td>4</td><td></td></tr>
<tr><td>7aii</td><td>number of people worldwide who has HIV increases every year from 2010 to 2014;

increase by 0.5 millions from 2010 to 2011 + consistent yearly increase by 0.6 millions from 2011 to 2016;

number of people who had HIV is accumulative over the years;</td><td>1

1

1</td><td></td></tr>
<tr><td>7b</td><td>keep to one sex partner;
males to wear a condom if they are not sure whether their partners or themselves are infected with AIDS;
do not abuse drugs or share instruments that could break the skin;
use sterilised or disposable instruments for acupuncture, ear-piercing or tattooing;</td><td>Any 3</td><td></td></tr>
<tr><td></td><td>Total</td><td>10</td><td></td></tr>
</table>

8a	trees containing genes that makes them more resistant to fires survive longer compared to trees that cannot resist fires; higher rate of reproduction of trees that can resist fires + natural selection; resulting in increase genetic variation; offsprings inherit beneficial traits that allows them to adapt to the environment; after a few generations, trees with resistance to fires increases as only the desirable traits are passed down to the next generation;	1 1 1 1 1	
8bi	artificial selection is the method used to produce improved breed of plants and animals with desirable traits by selective breeding	1	
8bii	cows + increase production of good milk; soya bean plant + production of seeds with high oil content;	1 1	e.g. from TB
8c	Social implications: May cause allergies in humans/ Easier and cheaper to produce medicine + more affordable + more patients can get access to them and be treated/ Higher risk of contamination by disease-causing microorganism present in animals/ Loss of biodiversity due to drop in population of animals or plants/ May be toxic or cancer-causing + modifying a single gene could result in alteration of metabolic processes producing unwanted toxins/ Ethical implications: Vegetarians or religious groups will object the use of medicine obtained from animals/ Morally wrong to exploit animals for medical research/ Deliberate creation of new combinations of genes that may be used in chemical or biological warfare/	1 1	
	Total	10	

E9a	2 copies of X chromosomes in chromosome 23 + female; 3 copies of chromosome 21 + Down's syndrome; mutation caused chromosome 21 to not separate during gamete formation resulting an egg to have 2 copies of chromosome 21 + after fertilisation, zygote has 3 copies of chromosome 21 / individual inherit one X chromosome from mother and one X chromosome from father;	1 1 1	
E9b	radiation and chemicals are mutagens that increase the rate of mutation + mutation will disrupt the normal functions of a cell; individuals with beneficial mutation leave more offspring + frequency of mutant allele will increase in population of organism; new traits may arise after many years + resulting in new species/ organisms with more favourable traits to survive and reproduce + evolution of a population;	1 1 1	
E9c	*A fragment of DNA in human chromosome that contains the gene of interest is obtained + restriction enzyme cut restriction site of gene at the two ends of the gene to produce sticky ends;* A plasmid from a bacterium is obtained + cut plasmid with same restriction enzyme + producing sticky ends complementary to the ends of the insulin gene; Mix the plasmid with the DNA fragment containing the gene of interest + bind to plasmid by the complementary base pairing between their sticky ends + DNA ligase to seal + forming a recombinant plasmid; Mix recombinant plasmid with E.coli bacterium + apply temporary heat or electric shock to open up pores in the cell surface membrane of the bacterium for the plasmid to enter + forming a transgenic bacterium + transgenic bacterium will use the new gene to make insulin + isolated and grown for mass production of human insulin + insulin has to be extracted and purified before use;	 1 1 1 1	Cutting of insulin gene Cutting of plasmid Formation of recombinant plasmid Formation of transgenic bacterium
	Total	10	

O9a	generally, farmland has a greater number of samples compared to in the cities; number of samples is greater when less than 5 different insecticides were used/ number of samples is zero in cities and significantly lower in farmland when 5 or more different insecticides were used; as the number of different insecticides used increases, number of samples decreases;	1 1 1	
O9b	agricultural activities in farmland results in a greater number of samples recorded in farmland compared to cities; greater concentration and frequency of use of insecticides in farmland compared to cities; to kill and repel insects who feed in the crops;	1 1 1	
O9c	honeybee is important pollinators in agriculture; decrease in population of honeybees will reduce the rate of pollination of plants that produce the crops; decrease crop yield in the farmland as rate of reproduction of plants slows down; decrease food production + reduce food sources to feed human population;	1 1 1 1	
	Total	10	