Hee Xin Wei
OVERMUGGED
O Level Mock Paper ANSWER

BIOLOGY **6093/01**

Paper 1 Multiple Choice **September 2021**

1 hour

INSTRUCTIONS TO CANDIDATES

There are **forty** questions in this paper. Answer **all** questions. For each question, there are 4 possible answers, **A, B, C and D**.

Choose the one you consider correct.

Each correct answer wills score one mark. A mark will not be deducted for a wrong answer.
The use of an approved scientific calculator is expected, where appropriate.

Questions in reference to Zhong Hua Secondary School, Dunearn Secondary School, Kuo Chuan Presbyterian Secondary School and Catholic High School. Credits to these school! ☺

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

Hee Xin Wei
OVERMUGGED
O Level Mock Paper ANSWER

BIOLOGY **6093/02**
Paper 2 **September 2021**
1 hour 45 minutes

INSTRUCTIONS TO CANDIDATES

Write in dark blue or black pen.
You may use an HB pencil for diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.

Section A
Answer **all** questions.
Write your answers in the spaces provided on the Question Paper.

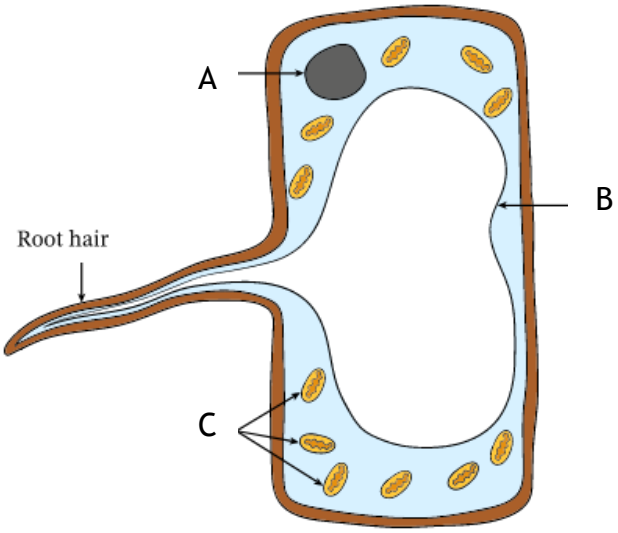
Section B
Answer **all** questions, the last question is in the form either/or.
Write your answers in the spaces provided on the Question Paper.

Electronic calculators may be used.

You are advised to spend no longer than one hour on Section A and no longer than 45 minutes on Section B.
The number of mark is given in brackets [] at the end of each question or part question.

Section A
Answer **all** questions.
Write your answers in the spaces provided.

1. Figure 1.1 shows a root hair cell.



(a) State the name of A, B and C as shown in figure 1.1.

A: Nucleus [1]

B: Vacuole [1]

C: Mitochondria (R: Mitochondrion) [1]

(b) How is the cell in figure 1.1 different from conventional plant cell?

Root hair cells do not have chloroplasts, while conventional plant cells do.[1]

(c) Root hair cells have many mitochondria. Suggest why root hair cells have a large number of mitochondria.

Root hair cells carry out aerobic respiration to release energy [1]

Energy is needed for active transport of mineral salts and ions [1]

(d) There are many other type of cells that require a large number of mitochondria.

(i) Suggest another example of plant cells that have a large number of mitochondria

Companion cell / phloem [1]

(ii) Suggest an example of human cells that also have a large number of mitochondria

Liver cell / villi [1]

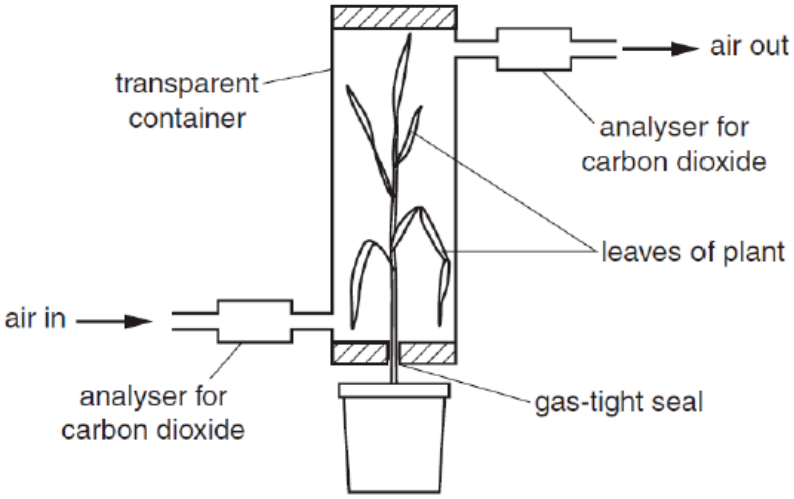
(ii) Describe the function of cells from d(ii)

Liver cells - detoxification/break down alcohol, convert excess glucose to glycogen, synthesised essential protein, deamination produce bile, store iron [any 2]

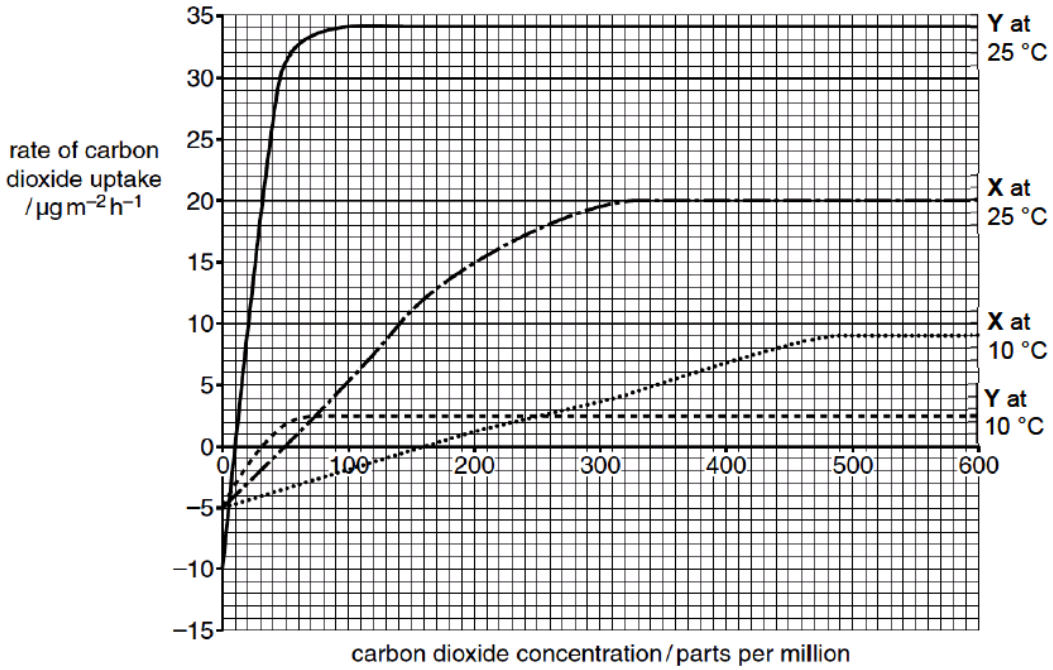
Villi - absorb glucose [1] and amino acids [1]

[Total:10]

2. The rate of carbon dioxide uptake at a range of carbon dioxide concentrations by two types of plants, X and Y, were compared at two temperatures using the apparatus shown in Fig 2.1.



The results of the experiment are presented in Fig 2.2



(a) Describe the general trend shown in figure 2.2.

When carbon dioxide concentration increases, rate of carbon dioxide uptake increases [1]
At some point, even when carbon dioxide increases, rate of carbon dioxide uptake plateaus/doesn't increase anymore [1]
Quote data from any graph [1]

(b) With reference to the graph for plant X at 25 °C in Fig 2.2, explain the term limiting factor.

- Pick 2: rate of CO_2 uptake corresponds represents / is proportionate to rate of photosynthesis
- increasing CO_2 concentration until 330ppm increases rate of uptake of CO_2 ; limiting factor because rate of photosynthesis increases with increasing level of CO_2
- conc is not limiting factor above 330ppm because ate of photosynthesis remains the same

(c) Explain how wilting occurs.

When the rate of transpiration exceeds the rate of water absorption [1]

plant cells become flaccid and plant wilts [1]

[Total:7]

3. An experiment was carried out to determined the effect of temperature on the rare of oxygen consumption for a species of lizard when it is at rest and when it is running. Lizards are reptiles that depend on external temperatures to help them regulate their internal temperatures.

Temperature (°C)	Oxygen consumptions (units)	
	At rest	Running
15	0.01	0.16
20	0.03	0.22
25	0.04	0.29
30	0.07	0.35
35	0.09	0.43
40	0.12	0.57
45	0.15	0.64
50	0.17	0.71

TABLE 3.1

(a) (i) State the equation for aerobic respiration, in symbols.

C6H1206 + O2 —> CO2 + H20 + large amount of energy [1]

(ii) Account for the difference in the rates of oxygen consumption in Lizard A when it is at rest and running.

Oxygen consumption, which is the rate of respiration is higher during running than resting [1]
Pick any 2:
Muscles contract more during running and resting
More oxygen is needed as substrate of aerobic respiration
to release more energy to meet the demand of increased muscle contraction

(iii) In another experiment, the oxygen debt of the lizards was also measured during running.

Explain how is an oxygen debt formed, and how is oxygen debt paid back.

How it formed: muscle cells respire anaerobically to meet the energy demands of the activity. [1] a buildup of lactic acid in the muscle cells [1]

Max 2:
How it is paid back: Lactic acid is removed and transported back to the liver.[1] In the liver, oxygen is used to oxidise some lactic acid to release energy. [1] This energy is used to convert the remaining lactic acid back into glucose.[1] When all the lactic acid has been converted to glucose, the oxygen debt is repaid. [1]

(b) Explain how is lung adapted for its role to obtain oxygen and remove carbon dioxide

Any 3:

Many alveoli, large surface area for the exchange of gases

The wall of the alveolus is one cell thick, short diffusion distance

A thin film of moisture around alveoli to allow oxygen to dissolve in it before entering the blood vessel

The walls of the alveoli are richly supplied with blood capillaries, maintain the concentration gradient of gases

(c) The same experiment is conducted on human.

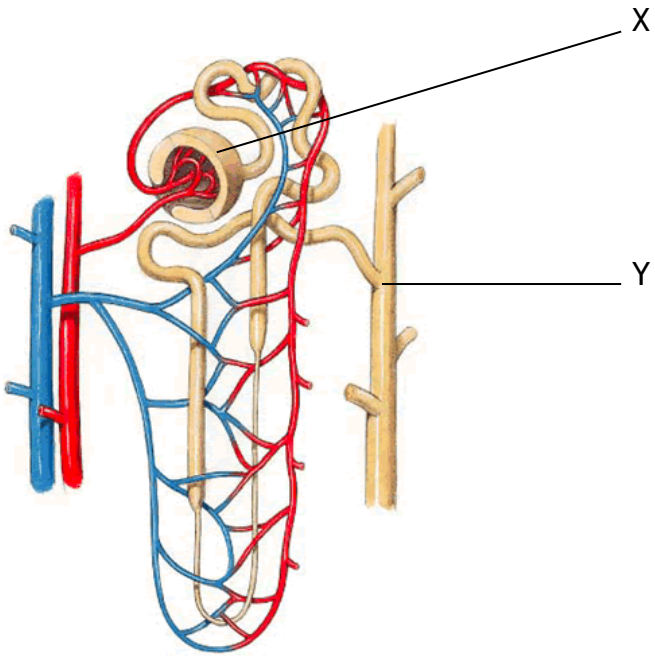
With reference to table 3.1, suggest how would you expect the effect of temperature on the oxygen consumption to be different in human during running.

As temperature increases from 15c to 50c, oxygen consumption in lizards increases from 0.16 to 0.71, but oxygen consumption in human would decrease beyond 37c [1]

Enzymes denature above optimum temperature, reducing rate of reaction [1]

[Total:13]

4. Figure 4.1 shows a nephron



(a) Define excretion

Excretion is the process by which the body removes metabolic waste products and toxic materials [1]

(b) State the name of X and Y as shown in figure 4.1.

X Bowman capsule [1]

Y Collecting duct [1]

(c) Amy went to hike Bukit Timah Hill on a Sunday noon time. It is very hot and she forgot to bring her water bottle, so she didn't drink much water.

With reference to figure 4.1 and your knowledge about the homeostasis, describe the events her body would react to the situation

(Cap at 3)

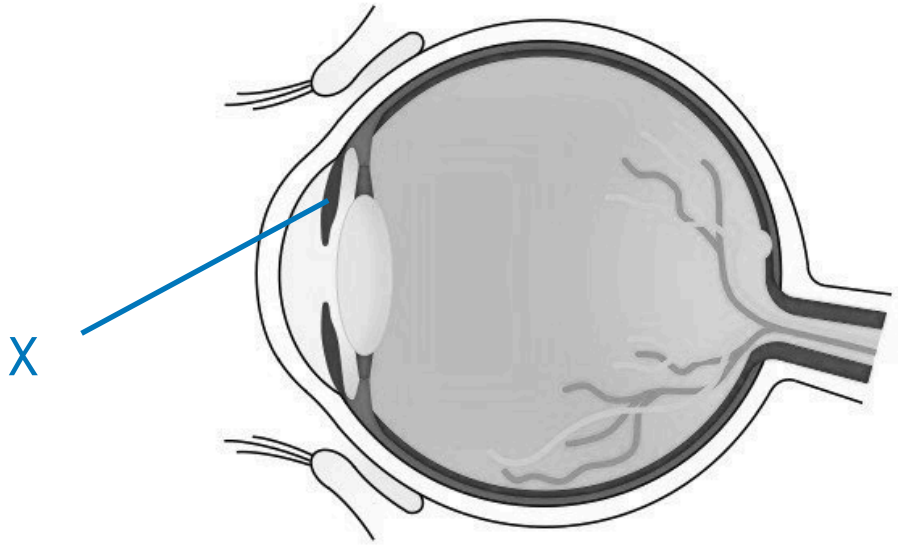
- Blood water potential decreases beyond normal, osmoreceptors in hypothalamus detects the decrease in water potential, send signal to pituitary gland
- Pituitary gland is stimulated to secrete more ADH into the blood
- ADH makes the distal convoluted tubules and the collecting ducts more permeable to water.
- More water to be reabsorbed, producing a smaller volume of more concentrated urine.

(Cap at 3)

- Thermoreceptors detects increase in temperature, send signal to hypothalamus
- Stimulate vasodilation of arterioles in our skin, increase blood flow in capillaries in skin so more heat is lost through conduction, convection and radiation.
- weat glands become more active and increase sweat production.
- Decreased in metabolic rate to reduce amount of heat produced by our body

[Total:8]

5. Figure 5.1 shows a horizontal section of the human eye



(a) The change in appearance of the pupil when entering an area of bright light is a reflex action.

(i) Define reflex action.

Reflex actions are immediate and involuntary responses [1] to a specific stimulus [1]

(ii) Label the effector of pupil reflex as X on the diagram [1]

(b) It is recommended that students should not read too close to books or look too close to screens for a long period of time. Suggest why is that so.

Ciliary muscles contract, causing suspensory ligaments to become relax. [1] Suspensory ligaments slacken, relaxing their pull on the lens. [1] The lens becomes more convex to focus sharply on close objects [1].

Compulsory: Ciliary muscles would be strained if we students look at close objects for a long period of time [1]

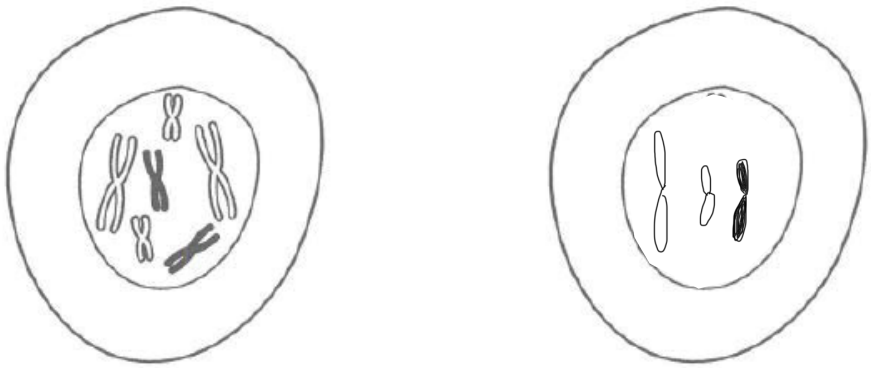
[Total:6]

6. The table 6.1 shows the number of chromosomes and the mass of DNA in different nuclei from the same animal at different stage of cell.

Nucleus	Number of chromosomes	Mass of DNA / arbitrary units
Prophase of mitosis	34	80
Telophase of mitosis	34	40
From a sperm cell	17	20

(a) Complete this table. [4]

(b) Figure 6.2 shows a cell containing three pairs of chromosomes at early stage of prophase I of meiosis.



(i) Draw in figure 6.2 how the daughter cells would look like after telophase II. [1]

(ii) Describe how what happens to the cell shown in figure 6.2 during prophase I of meiosis.

Pick 3:
- Synapsis occurs where homologous chromosomes pair up
- Crossing-over may occur where some DNA is exchanged at chiasmata between homologous chromosomes
- Nucleolus disappears
- The nuclear envelope disintegrates.
- REJECT: The chromatin condense, coil and shorten to become chromosomes

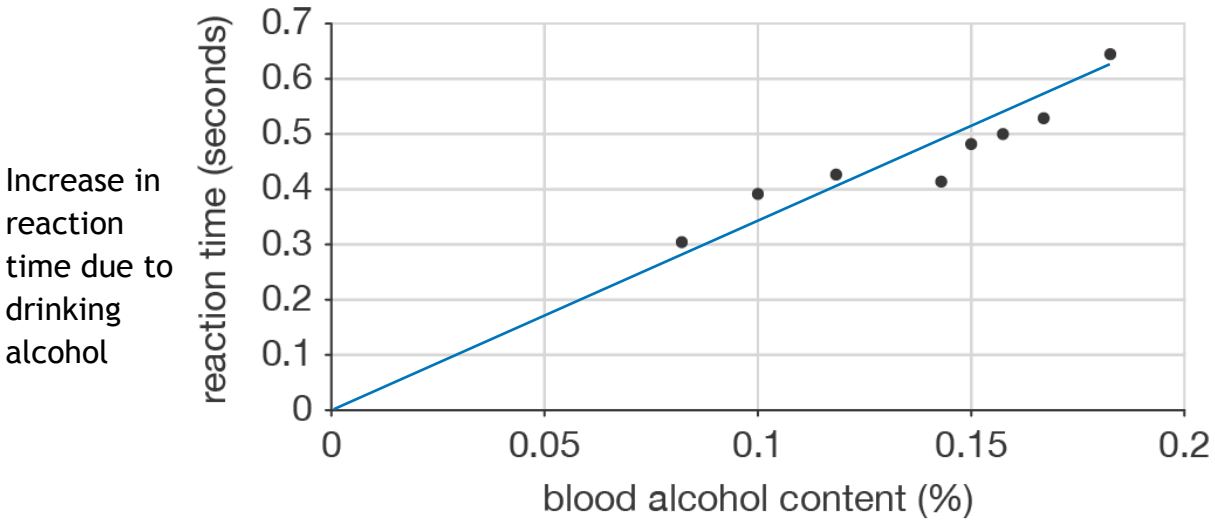
[Total:8]

Section B

Answer **three** questions

Question **9** is in the form of **Either/Or** question. Only one part should be answered.

7. Figure 7.1 shows how blood alcohol content would affect reaction time



(a) Draw a best fit line on figure 7.1. [1]

4 points above, 4 points below

No extrapolation

Start from 0,0

(b) With reference to figure 7.1, why is drink-driving extremely irresponsible?

When blood alcohol content increases from 0.08% to 0.18%, reaction time increases from 0.3 to 0.65 seconds [1]

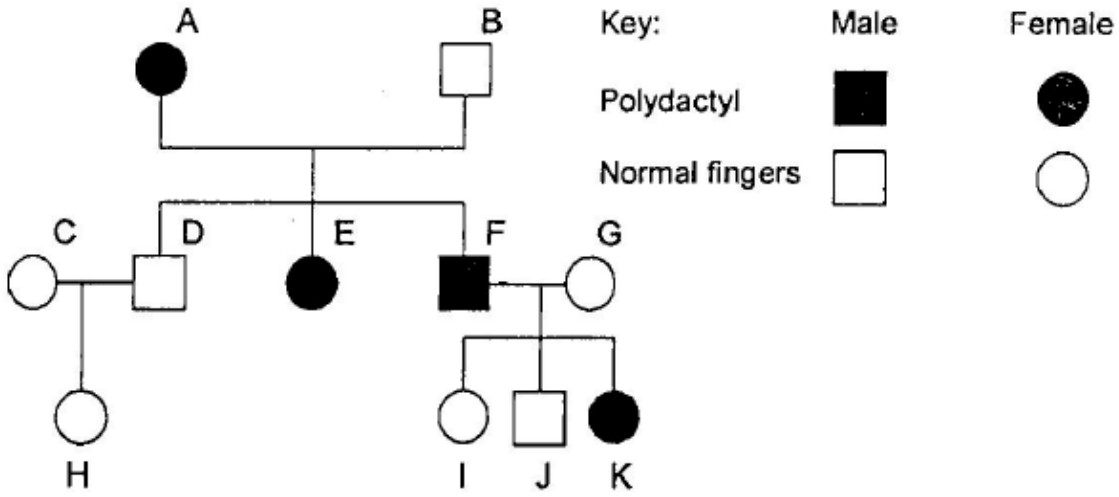
Inhibit central nervous system, can cause car accident [1]

(c) Specific genetic variants affect alcohol metabolism, helping determine whether drinking is a pleasant or unpleasant experience.

Is alcohol metabolism is continuous variation or discontinuous variation.

Continuous variation [1]

(d) Polydactyl is a rare condition that causes the development of extra fingers. The condition is caused by a dominant allele. Figure 7.2 shows the inheritance of polydactyl in a family.

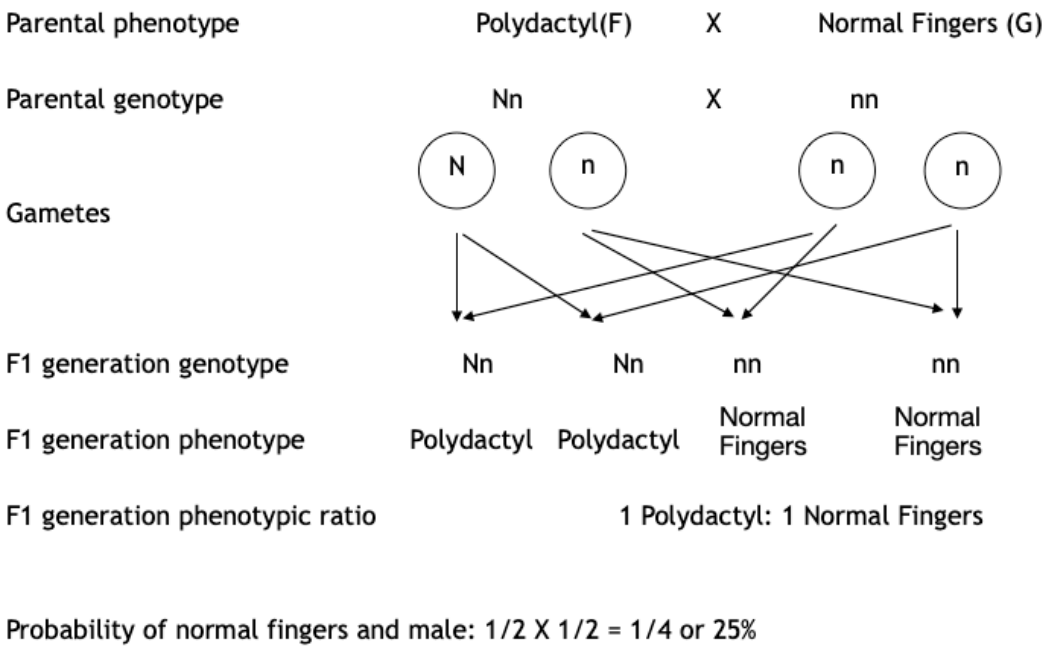


Using N as the dominant allele, n as the recessive allele

(i) State the genotype of individual F

Nn / heterozygotes [1]

(ii) With the help of a genetic diagram, explain the probability of the fourth kid of individual F and individual G to be a normal fingers, male child. [5]



Probability of normal fingers and male: 1/2 X 1/2 = 1/4 or 25%

8. (a) When administering antibiotics, doctors and pharmacists will instruct patients to finish the entire course of treatment, even if you are feeling better. Some bacteria have evolved to be resistant to antibiotics

Explain how some bacteria evolved to become resistant.

- Variation among individuals within the population, bacteria that is resistant or not resistant
- limited resources, resulting in competition for scarce resources
- Resistant bacteria are adapted to environment with antibiotic and can survive
- Reproduce and pass down their favourable alleles to their offspring
- offspring increase in proportion in the population thus the proportion of favourable allele also increases
- natural selection, survival of fittest
- Evolution is the change in allele frequency in a population. Over a long period of time, it can produce major changes of allele frequency in a population that could give rise to a new species.

(b) Explain, with named example, how biotechnology has helped mankind to improve the quality of crops thus improve food production

- Gene such as resistance to pests and herbicides/resistance to drought/resistance to flood/enhanced nutrient is isolated with restriction enzyme
- Plasmid from E.coli is cut with the same restriction enzyme
- Mix the plasmid with the DNA fragment, which will join together with DNA ligase
- Mix the recombinant plasmid with E.coli bacterium by applying heat shock or electric shock to open up the pores of bacteria for recombinant plasmid to enter
- Allow this bacterium to infect plant cells.
- Induce the plant cells to produce recombinant plants. A plant that has acquired a foreign gene is a transgenic plant.

Either

9. (a) Describe the role of the amniotic fluid and umbilical cord during pregnancy

Max 3
- Acts as a cushion to absorb shock and protect the foetus against mechanical injury.
- Allows the foetus to move freely during growth
- Prevents the foetus from dehydration.
- Maintains a constant temperature for optimum development of the foetus.
- Acts as lubricating fluid for the passage of the baby at birth.

Max 2
- One umbilical vein transports oxygenated blood and food substances from the placenta to the foetus.
- Two umbilical arteries transport deoxygenated blood and metabolic waste products from the foetus to the placenta.

(b) Compare an insect pollinated and a wind-pollinated flower, and describe the disadvantages of cross pollination.

Compare: Petals/scent/nectar/nectar guide/stamen structure/stigma structure/pollen grains (max 3)

Disadvantages: (max 3)
Two parent plants are required.
External agents of pollination i.e. wind, insects are required.
A great number of pollen grains are wasted due to the randomness of the dispersal methods.
Lots of energy is required to make large amounts of pollen grains.

Or

9. (a) Describe the fate of glucose that was just digested in the small intestine.

Pick 2:
Glucose absorb by villi
Enter the blood capillaries
By diffusion or by active transport depending on concentration gradient
Pick 2:
Transport from small intestine to liver by hepatic portal vein
Excess glucose converted to glycogen in the liver
Transported to tissue cells for respiration

(b) Describe the route taken by a molecule of carbon dioxide after it is released by the respiring tissue in the kidney to when it is expelled out of the body.

(3 marks)
Renal vein + vena cava
Back to the heart / Right atrium / right ventricle
Pulmonary artery to lung

(Max 3 marks)
Diffuse from blood capillaries into alveoli
Bronchioles —> bronchi
To the trachea
Larynx —> pharynx
Nasal passages / nostrils