

JOINT PRE-MOCK

231/2 Biology Paper 2

September 2021

MARKING SCHEME.

1.

Parents'

♂

♀

Parental phenotype

black coat

white coat

Parental genotypes

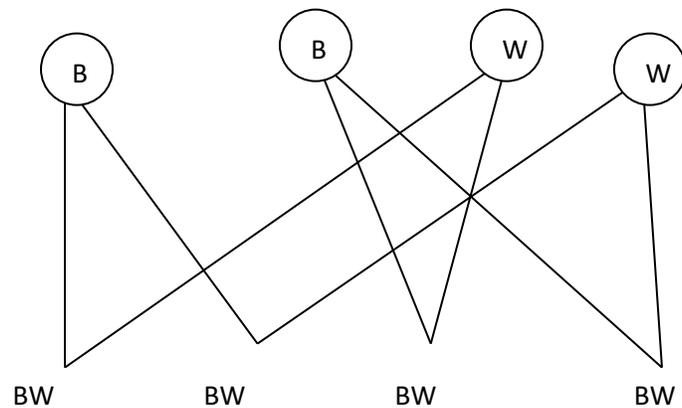
BB x

WW

;

Gametes

Fertilization



Phenotypes – all grey ;

b) Incomplete dominance/ partial dominance;

c) To establish the genotypes of the off springs/organism;

d) Results in new gene combination/recombination; causing variations/hybrid vigour;

e) Blood groups;

2. a) I – ovulation;

- b) T – Graafian follicle;
R – Corpus luteum;
- c) T – follicle stimulating hormone;
R – Luteinizing hormone;
- d) (When sperm comes into contact with egg)
Acrosome bursts open and releases lytic enzymes which dissolve egg membrane;
- Acrosome then turns inside – out forming a fine filament that penetrates the egg;
- Head of sperm enters ovum, tail is left outside the ovum;
- Vitelline membrane undergoes chemical reorganization which stops any other sperm from entering ovum; once in cytoplasm head burst releasing male nucleus which then fuses with female nucleus to form a diploid zygote;

3. (a) A rise in thermometer reading/Increased temperatures; (Rise in Temperature)

During germination seeds use oxygen for respiration; to produce energy, some in heat form; hence rise in temperature.

- (b) To prevent bacterial respiration hence heat production;
- (c) For easier circulation of air within the flask;
- (d) To prevent heat loss; (warm air is less dense rises up in the flask)

To allow carbon (IV) oxide to escape because it is denser than air.

- (e) Conserve heat; / to prevent heat loss or heat gain
- f) Use a thermometer with a narrower capillary bore.

4. (a) (i) Walls of stomach;

(ii) Stimulates the secretion / production of gastric juice; ✓

(b) Presence of food in the stomach;

(c) I.A – Blood capillaries; REJ CAPILLARY B – Lacteal;

II. Lymphatic system

(d) - Produces plenty of mucus to lubricate coarse/indigestible material during peristalsis;

- Wide human accommodates /store indigestible food
- Elongated to increase surface area for absorption of water.
- has muscles to enable peristalsis when they contract;

5. (a) (i) **P** – Tracheids **Q** – pits

(ii) **P**- water conduction

(b) Function of phloem – translocation/ transport of organic substances from the leaves to the rest of the plant;

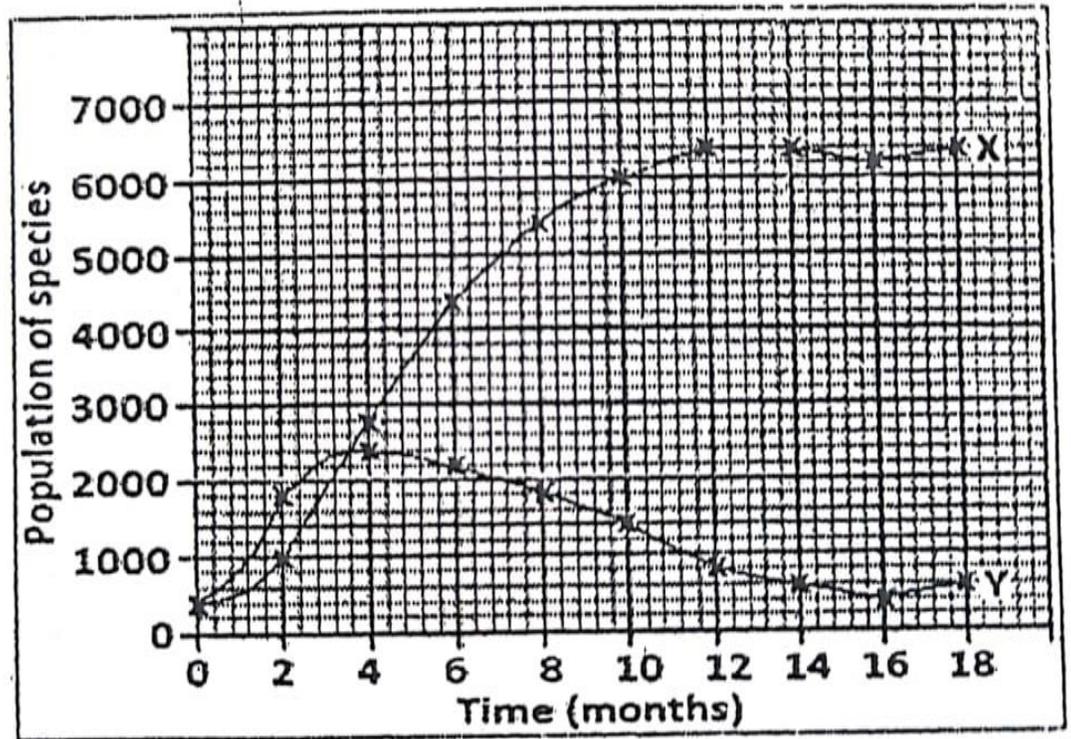
(c) (i) Translocation of food will not occur acc. Slow translocation

(ii) Reason – it is the companion cell that contains numerous mitochondria which provide adequate energy for translocation;

(d)

Phloem	Xylem
1) Made of living cells	- made of dead cells
2) Have companion cells	- lack companion cells
3) Have cytoplasmic strands	- lack cytoplasmic strands
4) Lack lignin deposits	- have lignin deposits; (<i>any</i> <i>2x1=2mks</i>)

6 a. Graph of population against time



- a) Competition; *Accept parasitism*
- b) i) Both populations increase; due to more food and hence less (interspecific) competition for space and food; the increase in population of species Y is higher/ faster than that of X; Y has a shorter life cycle than X; Y has faster growth and maturity rate than X; Y lays more eggs/ has faster reproduction rate than X;
- ii) Population of X is higher than that of Y; population of X increases with increase in time; population of Y decreases with increase in time; X is a better competitor for food; X has a longer life expectancy/ span than Y; X could be parasitic on Y; a disease infestation that only affects Y;
- c) Another organism predatory to X migrated or were introduced into the orchard; X migrated out of the habitat; spraying of the orchard with a pesticide/ chemical that kills X; high explosion on the number of aphids so no competition for food;
Owtte.
- d) Capture recapture method; as many wasps as possible were caught; marked and counted; the number was recorded as first marked; the exercise was repeated 24 hours later; as many wasps as possible were caught; their number counted and recorded as second capture; the number of wasps in the second

capture that had the original mark was determined and recorded as marked recapture; the population was calculated as;

$$\text{Population} = \frac{\text{First marked} \times \text{Second capture}}{\text{Marked recapture}}$$

7. Describe the role of the following organs in excretion and homeostasis.

a) The liver (10 mks)

Regulation of blood sugar; when blood sugar is below normal/90mg/100cm³ glucagon; Stimulates/triggers the conversion of glycogen to glucose in the liver/by the liver cells/hepatocytes; the glucose is released into the blood stream; Glucose level returns to normal; When the blood sugar is in excess/above normal/90mg/100cm³, insulin; causes/triggers/stimulates the liver cells to covert glucose to glycogen/fats which is stored; by increasing the rate of metabolic activitie,energy is produced; Excretion of bile pigments/biliverdin and bilirubin produced due to breakdown of worn out red blood cells; deamination/removal of amino group from excess amino acids to form urea; and detoxification/poisonous substances are made harmless/less toxic;

Max 10

b) The skin during hot environmental conditions (10 mks)

Sweat glands excrete urea; excess water and salts; hence maintaining salt and water balance in the blood/osmoregulation; evaporation of sweat; cools the body due to loss of latent heat of vaporization; when the body temperature rises above normal; blood vessels in the skin vasolidate; allowing more blood to flow near the skin surface; thus heat is lost to the environment by radiation/convection;Erector pili muscles relaxes; hair on the skin surface flattens/lie flat; reducing insulation/trapping less air; hence heat is lost from the body by radiation/convection;

Max 10

8. a) Fossils records.

Fossils are preserved remains of ancestral forms that lived long time ago mainly formed from preserved hard parts found on sedimentary rocks; when fossils of related organisms are arranged in chronological order which is made possible by carbon dating, they form fossils records which reveal trends in evolution overtime in the organism concerned; this gives direct evidence of the type of organism that existed at certain geological algae.

b) Geographical distribution of organisms.

The theory of continental drift supposes that at some time the present day continents were one single landmass which later drifted apart; closely related organisms were separated and isolated from one another thus evolving differently which leads to formation of different species through

natural selection; each set of organism adapted to different set of environmental conditions eg. Camels in Africa and llama in South America.

c) Comparative embryology.

Embryology is the study of formation and development of an embryo. The embryos of different vertebrate groups (fish, birds, amphibians, reptiles and mammals) are morphologically similar during the early stages of development; This relationship is as a result of their common ancestry. The closer the resemblance between the early stage embryos, the closer is their evolutionary relationship; this theory is called recapitulation theory.

d. Comparative anatomy

This is comparing the form and structures of different organisms in those organisms which show similarities suggest that they have a common or related ancestry; Adaptive radiation is where the divergent forms originating from a single ancestral form may become adapted to different ecological niche in a given habitat; Homologous structures are those parts that have a common embryonic origin but may be modified to perform different functions ;e.g. the forelimb of a bat is modified to form a wing for flight, the forelimb of a horse is elongated to enhance speed in running.

Analogous structures are those structures that have different embryonic origin but have evolved to perform similar functions due to the exploitation of the same kind of environment; Examples of analogous structure are wings of birds and those of insects have different embryonic origin but both are adapted for flight.

Vestigial structures are those structures that have in the course of time ceased to be functional and therefore have become reduced in size or rudimentary; eg coccyx in humans, nictitating membrane in the eye of the mammals.

e) Comparative serology

Experiments with serum (serological tests) are used to show phylogenetic relationships e.g. If human serum is injected into a rabbit, the proteins in the serum act as antigens. The rabbit produces antibodies against the human proteins. When blood with antibodies is drawn from the rabbit and mixed with serum from different animals, an immunological reaction occurs forming a precipitate. The amount of precipitate formed varies from one animal to the other. The greater the amount the closer the phylogenetic relationship between the animal and the human being; the lesser the precipitate shows that few or no antigen is common in organism hence are far apart i.e no common ancestry;

f) Cell biology

The cells of all higher organisms show basic similarities in their structure and functions. Thus all these cells contain cell membranes and organelles such as ribosome, Golgi bodies, and mitochondria;

They also have some biological chemicals in common e.g. ATP and DNA. This strongly indicates that all cell types have a common ancestral origin;

Also plant cells contain cellulose cell wall, cell sap, chloroplast etc. all these features are absent in animal cells. Among animals blood pigments are of universal occurrence. These include haemoglobin (vertebrates and invertebrates), haemocyanin (molluscs and crustaceans) and chlorocruorin (annelids).