**BIOLOGY PAPER 2 MARKING SCHEME**

**DECEMBER EXAM 2021**

**FORM FOUR**

1. Both PP; 1 mk

 Explanation: Both parents are phenotypically normal but produced a phenylketonuric child. This means that both must be heterozygous for the phenylketonuria gene; 1 mk

b) Parental phenotypes normal normal ;

 Parental genotype PP X PP Meiosis

 Gametes P P P P

 F1 generation PP Pp Pp pp

 Normal Carriers phenylketonuric

 Possible genotype of normal child 4 is PP; or PP;

1. Marriage between closely related individuals leads to unmasking of harmful mutations; (1 mk) that were hidden in the heterozygous state; (1 mk)

2. a) C; (1 mk) it is the uterine wall where implantation occurs; (1 mk)

1. Part b secretes the hormones oestrogen and progesterone before 4 months of pregnancy; (1 mk). This role is taken over by the placenta hence they have no active role; (1 mk). Progesterone and oestrogen maintain pregnancy

c) i) Treponema pallidum; 1 mk

 ii) Candida albicans; 1 mk

 iii) Neisseria gonorrhoea; 1 mk

* 1. Human Immuno Deficiency virus Rej. HIV 1 mk

**Note:** Reject names that are not underlined (i- iii)

 d) -lack of protection; 1 mk

 -Low chances of fertilization; 1 mk

3. (a)Homeostasis is the process of maintaining a constant internal environment; eg. Body

 temperature, osmotic pressure;

(b) -20 minutes;

(c)-In a cold bath, the body tends to lose much more heat through convection and conduction, causing the body temperature to fall;

(d)

(i) The liver (2mks)

In the liver, heat is produced as a result of numerous chemical activities occurring there; The heat is distributed by blood to other parts of the body;

(ii) Blood vessels in the skin. (2mks

The low external temperature brings about a reflex constriction of the skin arterioles; less heat flows through the skin and less heat is lost;

(iii) Muscle of the body. (2mks)

Tissue respiration is very active in muscles setting free large amounts of heat; which is distributed to different parts of the body;

4. (a)

i.) The two paramecia share the same niche/ competes for same resources/ seeds on same food; P.Aurelia is faster growing/ better adapted; so it outcompetes p. caudatum

ii.) The two paramecia have slightly adjustment niches so they do not compete for resources and can co – exist.

b.) Two species cannot co – exist in the same habitat; if they share the same niches; (competitive exclusion principle)

5. a) Strong air currents / winds;

 High temperatures;

 Low humidity/dry conditions **any 2 pts = 2mks**

 Light / Bright light;

 b) Absence of leaves/stomata absent;

 Transpiration is reduced/ little transpiration; (2mks)

 c) Habitat for A: Arid/dry/desert/semi-desert; little amount of water loss/ low rate water loss

 Habitat for B: Areas of adequate water / high rainfall/ plenty of water;

 **Reason**: High rate of water loss / more water lost / A lot of water loss; (2mks)

. 6. (a) Scale (s) 1mk

 Axis (A) 1mk

 Identify (I) 1mk

 Curve (C) 2mks

All points correct (P) 2mks

 7mks

 Temperature 0c ½ A Time (Days) ½ A

 0 10 20 30 40 0 1 2 3 4 5 6 7 8 9

 Set up1: identify set up 2: identify ½ ½ S ½ S P√ P √C √C√ A √½

b) Day zero to day 2

 Set up 1 – Temperature increased with time; seeds were germinating and respiring to produce

 energy;

 Set up 2 – Temperature remained constant within this period; since seeds were boiled. No

 respiration occurred;

 After day 5

 Set up 1 – Temperature reduced slightly; After germination the seedlings respired

moderately;

 Set up 2 – Temperature increased with time; decomposition led to increase in heat

 production;

 8mks

 (c) Seeds in set up 3 were washed in antiseptic which killed the micro-organisms. No

 decomposition occurred; 2mks

 (d) Glucose + Oxygen water + carbon (iv) oxide + energy; 1mk

 **Rej. Chemical equation.**

(e) Fat – 0.7, high amounts of oxygen is used /consumed while carbohydrate 1.0 less oxygen is consumed / substrate is completely oxidised.

7.a ) –broad leaf lamina which provides a large surface area for the absorption of carbon (iv) oxide and light energy.

-thin leaf lamina reduces diffusion distance for light and CO2  to reach the photosynthetic cells.

-presence of stomata ensures efficient diffusion of carbon (IV) oxide into the leaf.

-the cuticle and epidermis are transparent to allow penetration of light to the palisade cells.

-palisade cells contain large number of chloroplasts and their arrangement and location next to the upper epidermis enables them to receive maximum sunlight.

-existence of extensive veins that contain vascular bundles which conduct water and mineral salts to the photosynthetic cells and removes the products of photosynthesis.

-spongy mesophyll cells are loosely arranged , leaving large intercellular air spaces that are interconnected for rapid diffusion of carbon (iv) into the cells and oxygen out into the atmosphere.

**Max 10mks**

b) ) When the finger touches a very hot object; pain receptors; in the skin of the finger are stimulated; Nerve impulses are triggered off; and transmitted through the sensory neurone; to grey matter of the spinal cord; The impulse is then transmitted to the relay neurone; through the synapse; then to the motor neurone; through another synapse; Through the ventral root, the impulse is transmitted to the effector organ (bicep of the arm); which contracts; and the forearm is withdrawn; and thus the finger is raised from the hot object;

**max 10mks**

1. **Locomotion in a finned fish.**

* + The fish has a streamlined body shape; to reduce resistance against movement / and enable it to cut through water easily;
	+ Inflexible head; that enables it to maintain forward thrush;
	+ Scales overlap backwards; to allow water to pass over the fish easily;
	+ Secretes mucus; which covers the body to reduce friction during movements;
	+ Flexible backbone onto which segments of myotomes are attached; The muscles contract and relax to bring about undulating movements;
	+ Swim bladder provides the fish with buoyancy; and help the fish adjust it vertical position in relation to depth in water;
	+ Lateral line; enables the fish to detect vibrations and change of pressure;
	+ Well developed fins; help the fish to move in water and maintain balance;
	+ Unpaired fish / dorsal, anal and caudal reduce rolling and yawing;
	+ Caudal fin propels the fish forward and steers; the fish while in motion;
	+ Paired/ pectoral fins are used for maintaining balance, braking and changing direction; they also control pitching of the fish; (**20mks)**