



*Dr. Blosa Science*

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+256 778 633 682, 753 802709  
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NAME:..... STREAM:.....

**SENIOR FOUR**

553/1

**BIOLOGY**

**PAPER 1**

**EXAM 11**

**TIME: 2 ¼ HOURS**

**Instructions:**

- Answer all questions in section A and B
- Attempt any one question from section C.



- A: on the palate  
C: at the back of the mouth
- B: in the centre of the tongue  
D: at the tip of the mouth
7. The largest section of the human brain is the ...  
A: medulla oblongata  
C: Cerebellum
- B: cerebrum  
D: optic lobes
8. Which type of soil promotes capillarity most?  
A: loam  
B: Sandy  
C: Clay  
D: Gravel
9. A person with blood group AB can donate blood to person of blood group .....  
A: A  
B: AB  
C: O  
D: B.
10. An example of continuous variation is  
A: presence of males and females in a community  
B: ability and inability to roll the tongue  
C: height in individuals  
D: Blood groups
11. In the human body urea is produced in the  
A: spleen  
B: kidney nephrones  
C: liver  
D: ileum
12. In the human beings, the white blood cells are made in .....  
A: spleen  
C: bone marrow  
B: liver  
D: lymphatic
13. The tracheal system of air transport exists in .....  
A: earthworms  
B: insects  
C: arachnids  
D: myriapods
14. The ratio of volume of carbon dioxide over volume of oxygen consumed during the same time in an organism is called  
A: Gaseous constant  
C: respiratory quotient  
B: Respiratory rate  
D: Diffusion gradient
15. Colour vision in human beings is made possible by  
A: the lens  
B: the cornea  
C: the rods  
D: the cones
16. The concentration of the plant hormone which stimulates shoot growth  
A: stimulates root growth  
C: stimulates growth of lateral roots  
B: inhibits root growth  
D: inhibits growth of apical buds
17. Zygosporangia are  
A: asexual reproductive structures of fungi  
B: sexual reproductive structures of fungi  
C: asexual reproductive structures of spirogyra

- D: sexual reproductive structures of spirogyra.
18. Which pair of bones belong to human forearm?  
 A: Femur and Radius  
 B: Fibula and tibias  
 C: Ulna and tibia  
 D: humerus and Radius
19. In mammals the embryo is contained .....  
 A: uterus  
 B: amnion  
 C: Placenta  
 D: Luteum
20. Chemical breakdown of Lactose yields  
 A: Glucose and fructose  
 B: Glucose and galactose  
 C: two molecules  
 D: maltose and fructose
21. Which of the following animals can use their skins as respiratory surfaces?  
 A: lizards and fish  
 B: frogs and tadpoles  
 C: frogs and earthworms  
 D: fish and tadpoles
22. Which of the following substances are filtered through the glomerulus?  
 A: Amino acids and red blood cells  
 B: proteins and urea  
 C: urea and amino acids  
 D: red blood cells and proteins
23. Which one of the following is a density dependent factor in controlling populations?  
 A: temperature  
 B: predators  
 C: rainfall  
 D: bush burning
24. Which part of the human skin plays a part in body temperature control?  
 A: erector pilli muscle  
 B: sebaceous gland  
 C: cornified layer  
 D: granular layer
25. Arrange the following in order of increasing complexity.  
 A: Embryo zygote, ovum, foetus  
 B: zygote, foetus, ovum, embryo  
 C: ovum, embryo, foetus, zygote  
 D: ovum, zygote, embryo, foetus.
26. Complete metamorphosis occurs in  
 A: houseflies and honey bees  
 B: cockroaches and termites  
 C: butterflies and housefly  
 D: houseflies and cockroaches
27. In the human heart, when the ventricles contract; .....  
 A: the heart fills with blood  
 B: the semi-lunar valves close  
 C: the triscupid valves open  
 D: biscupid valves close.
28. Diptera to which the mosquitoes belong, is characterized by:  
 A: three pairs of legs  
 B: two pairs of wings  
 C: two pairs of legs  
 D: one pair of wings

29. Short sight and long sight are eye defects caused by  
**A:** changing size of the lens  
**B:** aging of the lens  
**C:** changing diameter of the eyeball  
**D:** changing number of the rods and cones
30. A human bone connected in a hinge joint at one end and a ball and socket joint on the other is the .....
- A:** radius                      **B:** Femur                      **C:** ulna                      **D:** tibia

### SECTION B:

31. The table 1 below shows the body surface area and volume of two land mammals A and B

Table 1

Mammal	Surface area cm <sup>2</sup>	Volume cm <sup>3</sup>
A	1.2	0.92
B	0.6	0.18

Table 2

Environmental temperature (°C)	Metabolic rate (arbitrary units)	
	Mammal A	Mammal B
16	10.5	12.9
18	8.9	10.9
20	7.5	9.2
22	6.4	7.8
24	5.6	6.7
26	5.0	5.8

- (a) From Table 1

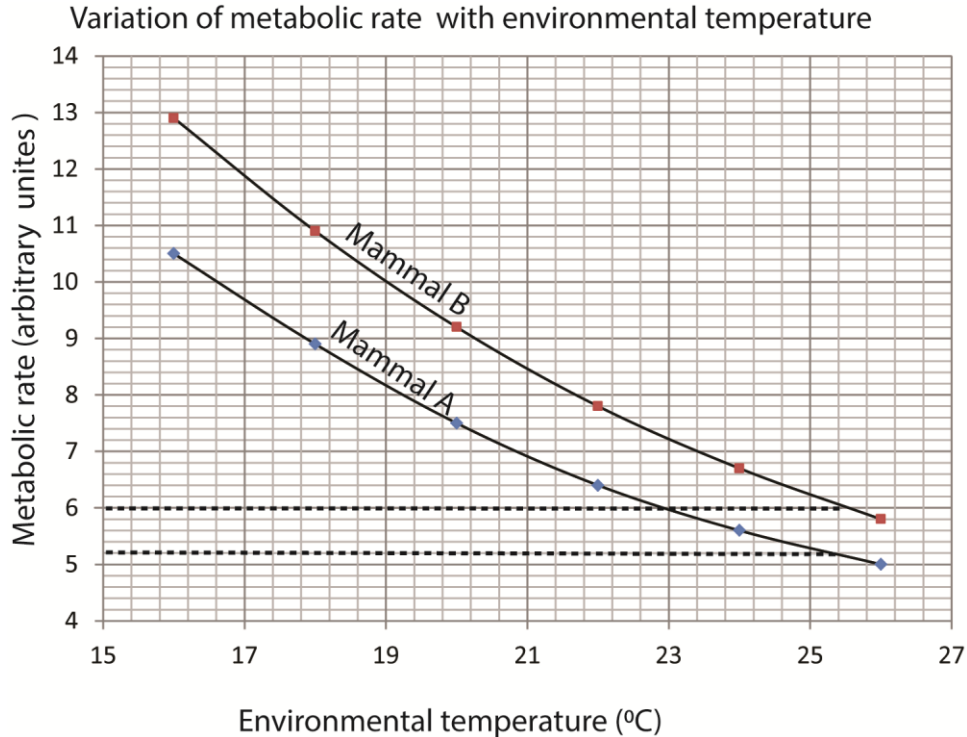
(i) Work out the surface area: Volume ratio of each mammal (2 marks)

Mammal	Surface area cm <sup>2</sup>	Volume cm <sup>3</sup>	Surface area : volume
A	1.2	0.92	1.3
B	0.6	0.18	3.3

(ii) State with a reason which of the two organisms above would be least affected by change in environmental temperature

A because it small surface area to volume ratio

- (b) Using the graph paper provided, plot on the same graph the metabolic rate of the two mammals against environmental temperature. (7 marks)



- (c) From your graph, determine the metabolic rate of each mammal at environmental temperatures of 25°C (2 marks)

Mammal A: 5.2 units

Mammal B: 6 units

- (d) (i) How does the environmental temperature affect the metabolic rate of the mammals? (2 marks)

When environmental temperature increases metabolic rate decreases

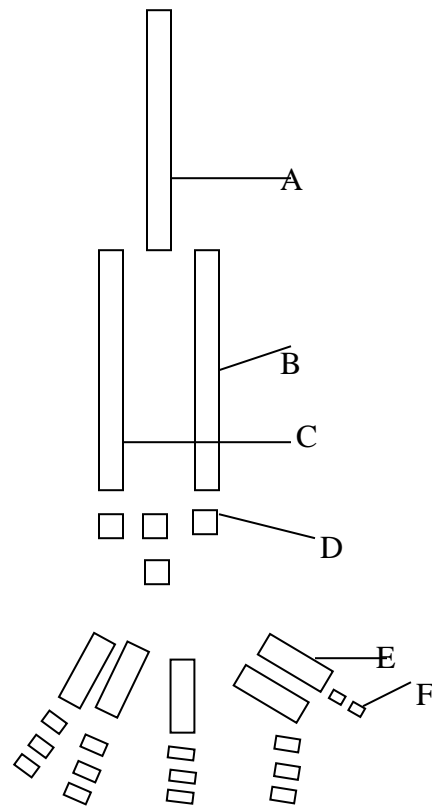
- (ii) Explain why variation of temperature affects the metabolic rate of the mammals as stated in d (i) above (2 marks)

As environmental temperature increase, metabolic rate decreases because less heat is needed to maintain body temperature

- (e) From the information provided, explain why at any environmental temperature, the metabolic rate of mammal B is higher than that of mammal A.

Animal B has large surface area to volume ration and therefore high rate of heat rate

32.



(a) (i) Identify the diagram above  
pentadactyl limb

(ii) Label the parts

A Humerus or femur

B Radius/Tibia

C Ulna/Fibula

D Carpal/Tarsal

E Metacarpal/metatarsal

F Phalanges

(b) (i) Name the joint formed between parts A and B

Hinge joint

(ii) Name the joints formed between the parts labeled F  
Hinge joint

(c) State 2 modification of the above plan of a limb in the birds  
The fore limb has lost the 4<sup>th</sup> and fifth digit

The 1<sup>st</sup> and 3<sup>rd</sup> digits are highly reduced

**Your appendicular skeleton is made up of everything else — the bones that attach (append) to your axial skeleton**

33. State one difference between the following pairs

<p><b>(i) Axial skeleton</b>  Axial skeleton is made up of the bones in your head, neck, back and chest.</p>	<p><b>Appendicular skeleton</b>  appendicular skeleton is made up of everything else — the bones that attach (append) to your axial skeleton</p>
<p><b>(ii) Bone</b> Bone is tough and hard</p>	<p><b>Cartilage</b> Cartilage is soft and flexible</p>
<p><b>(iii) Lumbar vertebrae</b> Long transverse process Short neural spine Large centrum</p>	<p><b>Thoracic vertebra</b> Short transverse processes Long neural spine Small centrum</p>
<p><b>(iv) Ligament</b> Connect one to bone</p>	<p><b>Tendon</b> Connect muscle to bone</p>

(c) State 3 adaptations of a bony fish to movement in water

- has streamline shape to reduce drag force
- has tail fin for propulsion
- has fins for stability
- has slippery body to reduce friction
- has swimming bladder for buoyance

**SECTION C:**

Attempt any **one** question

34. (a) How are birds adapted to locomotion by flight?

- (i) has feather that aid flight
  - (ii) hollow bone to reduce weight
  - (iii) bones are fused to reduce flexibility
  - (iv) lightweight, smooth feathers – this reduces the forces of weight and drag
  - (v) a beak, instead of heavy, bony jaws and teeth – this reduces the force of weight
  - (vi) an enlarged breastbone called a sternum for flight muscle attachment – this helps with the force of thrust
  - (vii) a streamlined body – this helps reduce the force of drag
- (b) Explain the muscular movements and their effects to bring about flight in birds.

**Active flight**

The bird fly by flapping the wings.

The large and powerful depressor muscle pulls the wing downwards and give the bird lift during active flight, when the Levator muscle contract it pulls the wing upwards.

35. (a) Explain the hormonal changes leading to the female menstrual cycle.

**Hormonal control of the menstrual cycle**

Pituitary hormones secreted by the anterior lobe of pituitary gland are Follicle stimulation hormones (FSH) and luteinising hormone (LH).

Ovarian hormones produced by the ovary are oestrogen and progesterone.`

The menstrual cycle of the human female showing the events occurring in ovary together with relative levels of oestrogen and progesterone.

- (i) Just after menstruation, the anterior lobe of the pituitary gland starts secreting FSH.
- (ii) FSH cause a Graafian follicle to develop in the ovary to secrete oestrogen.
- (iii)Oestrogen

- brings about the healing and repair of the uterine endometrium following menstruation.
- inhibits production of FSH
- stimulates production of LH.

In the course of 11 days or so the amount of oestrogen in blood stream steadily increases. Then shortly before evolution takes place, LH is released.

(iv)LH

- causes ovulation
- promotes development the Graafian follicle into a corpus luteum to secrete progesterone

(v) The corpus luteum secretes progesterone.

(vi) Progesterone

- This along with oestrogen, causes the continued thickening and vascularization of the uterine endometrium in preparation for implantation.
- Inhibits secretion of LH leading to degeneration of corpus luteum

(vii) For a week or so after ovulation the concentration of progesterone and oestrogen gradually increase and then suddenly decrease.

(viii) With the fall in the levels of the two hormones, the uterine endometrium begins to disintegrate and menstruation starts and the cycle repeats.

(b) How can a married couple avoid unwanted pregnancies?

**Methods of contraception include:**

- (i) long-acting reversible contraception, such as the implant or intra uterine device (IUD)
- (ii) hormonal contraception, such the pill or the Depo Provera injection.
- (iii) barrier methods, such as condoms.
- (iv) emergency contraception.
- (v) fertility awareness.
- (vi) permanent contraception, such as vasectomy and tubal ligation

END