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UACE BIOLOGY PAPER 1 2005 marking guide

SECTION A

1. Which one of the following is not a reason for classifying a mouse and a frog in one phylum?

Presence of

- A. pharyngeal gill slits.
- B. post-anal tail.
- C. notochord.
- D. endoskeleton.

Answer is D

2. In photosynthesis, the major advantage of the **C₄** pathway is to

- A. fix carbon dioxide in the Calvin cycle.
- B. concentrate carbon dioxide in the cells of leaves.
- C. fix carbon dioxide from the atmosphere into the leaves.
- D. store carbon dioxide in form of organic acids.

Answer is B

3. An athletic competition organized on high lands required participants from low lands to report

three months before the competition in order to enable them

- A. get familiar with the place.
- B. develop strong muscles.
- C. acquire high red blood cell count.
- D. have extensive deposition of fat under their skins.

Answer is C

4. The main distinguishing character of a eukaryotic cell is

- A. membraned organelles.
- B. lack of nuclear membrane.
- C. presence of nucleus.
- D. presence of DNA double strands.

Answer is A

5. Starch, glycogen and cellulose are all composed of

- A. α -glucose
- B. β -glucose.
- C. monosaccharides.
- D. polysaccharides.

Answer is C

6. Which of the following organelles would most likely be abundant in the tail of a tadpole at a time of its reabsorption during metamorphosis?

- A. Centrioles.

- B.** Lysosomes.
- C. Golgi apparatus.
- D. Endoplasmic reticulum.

7. If the rate of transpiration lags behind that of absorption, movement of water up to the plant is mainly by

- A.** root pressure.
- B. capillary.
- C. mass flow.
- D. transpiration pull.

8. An impulse crosses a synapse by means of

- A. sodium ions.
- B. potassium ions.
- C. calcium ions.
- D.** neurotransmitter chemical.

9. Which of the following increases the rate of phosphorylation of hexose sugar during the normal respiration process?

- A. An increase in-ADP concentration.
- B. An increase in ATP concentration.
- C. An increase in concentration of hexose sugar.
- D.** A decrease in concentration of phosphorylated sugar.

10. Which of the following factors would contribute least to the development of new species?

- A. Gene mutation.
 - B. Chromosomal mutation.
 - C. Geographical isolation.
 - D. Environmental stability.**
11. Which one of the following explains why digestion of fats does not occur in the human stomach?
- A. Absence of fat-digesting enzymes.**
 - B. Low pH for the fat-digesting enzymes.
 - C. High pH for the fat-digesting enzymes.
 - D. Absence of bile salts that emulsify the fats.
12. Which one of the following would contribute to the greenhouse effect
- A. Use of nuclear power.
 - B. Use of fossil fuels.**
 - C. Excessive use of fertilizers.
 - D. Accumulation of sewage in water bodies.
13. The increase in supply of blood to heavily respiring tissues, is caused high
- A. ventilation rate.
 - B. concentration of oxygen in the inhaled air.
 - C. carbon dioxide concentration in the blood.
 - D. carbon dioxide concentration in the tissues.**
14. Impulse transmission in mammals is usually faster than it is in amphibians because

- A. axons in amphibians lack myelin sheath.
 - B. mammals have axons with larger diameter.
 - C. mammals usually have higher body temperature.
 - D. the distance between the nodes of Ranvier in mammals is shorter.
15. Which one of the following would occur at the onset of an action potential in a neuron?
- A. Potassium ions enter.
 - B. Sodium ions leave.
 - C. Potassium ions leave.
 - D. Sodium ions enter.**
16. Which of the following applies to the cones of the retina? They
- A. show visual acuity.**
 - B. perceive dim light.
 - C. show much retinal convergence.
 - D. contain rhodopsin pigment.
17. The flagellum and skeletal muscle are structurally similar in that they have
- A. microtubules.**
 - B. actin and myosin tubules.
 - C. a pattern of 9+2 microtubules.
 - D. light and dark bands.
18. During the light stage of photosynthesis, water is an important raw material in that it

- A. gives off oxygen.
- B. provides hydrogen that reduces NAD.
- C. reduces carbon dioxide to carbohydrates.
- D. provides electrons.**

19. Which one of the following activities in living organisms can result in a respiratory quotient of less than 1.0?

- A. when carbohydrates are respired.
- B. During extensive laying down of fat in livestock.
- C. At compensation point, during photosynthesis.
- D. When the rate of exhalation equals that of inhalation.**

20. Which of the following is a difference between flowers of dicotyledonous plants and those of monocotyledonous plants? Flowers of dicotyledonous plant usually

- A. lack sepals.
- B. possess superior ovaries.
- C. bear floral parts in groups of 4s and 5s.
- D. possess fused petals.**

21. Deciduous plants in temperate zones shed off their leaves during winter.

- A. because of water shortage.
- B. to cut down the process of guttation.**
- C. because of too much water availability.
- D. to avoid freezing temperatures.

22. Which of the following is true about non-competitive inhibition in enzyme catalyzed reactions?

- A. The degree of inhibition decreases with increase in substrate concentration.
- B. The inhibitor has a similar structure and chemical composition with the substrate.
- C. The degree of inhibition is independent of the substrate concentration.
- D. The shape of the enzyme is not affected by the inhibitor.

23. Which of the following is not true of conifers?

- A. Lack vessels in xylem.
- B. Bear reproductive structures on leaves.
- C. Bear sporangia on cones.
- D. Possess unprotected ovules.

none

24. The lack of a nucleus in the red blood cells enables it to

- A. have a high affinity for oxygen.
- B. be more permeable to oxygen.
- C. give up oxygen more readily.
- D. contain more haemoglobin.

25. Which one of the following types of behavior is least learnt?

- A. Association.
- B. Instinct.
- C. Imprinting.

D. Insight.

26. The primary meristematic tissue in plants which gives rise to the cortex is the

A. ground meristem.

B. procambium.

C. protoderm.

D. protoxylem.

27. Which one of the following organisms does not possess simple eyes?

A. Spider.

B. Millipede.

C. Butterfly.

D. Centipedes.

28. Contraction of longitudinal muscles in insects during flight, results into

A. flapping of wings.

B. moving down of wings.

C. holding wings horizontally.

D. moving up of wings.

29. During fertilization in plants, the

A. vegetative nucleus fuses with the pollen nucleus.

B. generative nucleus fuses with the egg nucleus.

C. vegetative nucleus fuses with the egg nucleus.

D. generative nucleus fuses with the antipodal cell nucleus.

30. A desert mammal's lower lethal temperature is higher than that of a mammal living in cold regions because a desert mammal has

- A. small extremities.
- B. poor insulation mechanisms.**
- C. thick fur.
- D. a small surface area: volume ratio,

31. In the energy transfer in an ecosystem, the greatest loss in energy is between

- A. primary producers and primary consumers.**
- B. primary consumers and secondary consumers.
- C. secondary consumers and tertiary consumers.
- D. tertiary consumers and decomposers

32. A rhesus positive foetus whose mother is rhesus negative may not be born alive because the

- A. mother's body produces antigens against foetal antibodies.
- B. foetus lacks antibodies against the mother's antigens.
- C. mother's body produces antibodies against the foetal antigens.**
- D. mother's red blood cells mix with the foetal blood.

33. From a bush, 120 beetles were collected, marked and released back into the bush. A few days later, 120 beetles were collected from the same place, and 30 of them carried the mark. The estimated number of beetle in the bush is

- A. 240
- B. 360**

C. 480

D. 560

34. Insects have different mouth parts modified to suit their different modes of feeding, this shows

- A. speciation.
- B. convergent evolution.
- C. divergent evolution.
- D. development of analogous structures.

35. Which one of the following is true of linked characteristics? They

- A. are always transmitted as a single block
- B. are allelic to each other.
- C. occur on non-homologous chromosomes.
- D. can be transmitted independently.

36. Which one of the following may act as a respiratory surface in animals?

- A. Spiracle.
- B. Bronchus.
- C. Skin.
- D. Trachea.

37. Which one of the following pairs of responses in plants is caused by unequal distribution of auxins?

- A. Photoperiodism and phototropism.
- B. Geotropism *and* phototropism.
- C. Nastic movement and geotropism.

D. Photoperiodism and abscission.

38. The amount of progesterone in the blood increases steadily from ovulation to menstruation, then it begins to decline because

- A. luteinizing hormone inhibits its production.
- B. it is washed out with blood during menstruation.**
- C. implantation of a zygote occurs.
- D. its work of repairing the uterine wall gets complete.

39. Figure 1 shows the relationship between temperature and rate of photosynthesis in two plant species A and B.

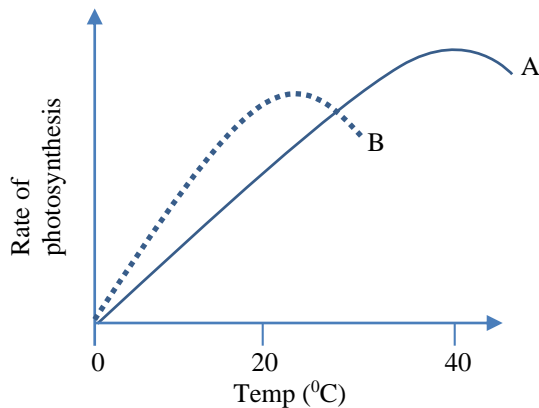


Fig. 1

Which one of the following is a correct conclusion from the results?

- A. B is a shade plant while A is a sun plant.
- B. A has a lower compensation point than B.
- C. A has a higher optimum temperature for photosynthesis than B.**
- D. Photorespiration does not occur in A but occurs in B.

40. The absorption of amino acids after eating a heavy proteneous meal is aided by

A. diffusion and active transport.

B. osmosis and diffusion.

C. diffusion and pinocytosis.

D. active transport only.

SECTION B

41. Figure 2 show the effect of red light interruption of night period, on flowering of a plant.

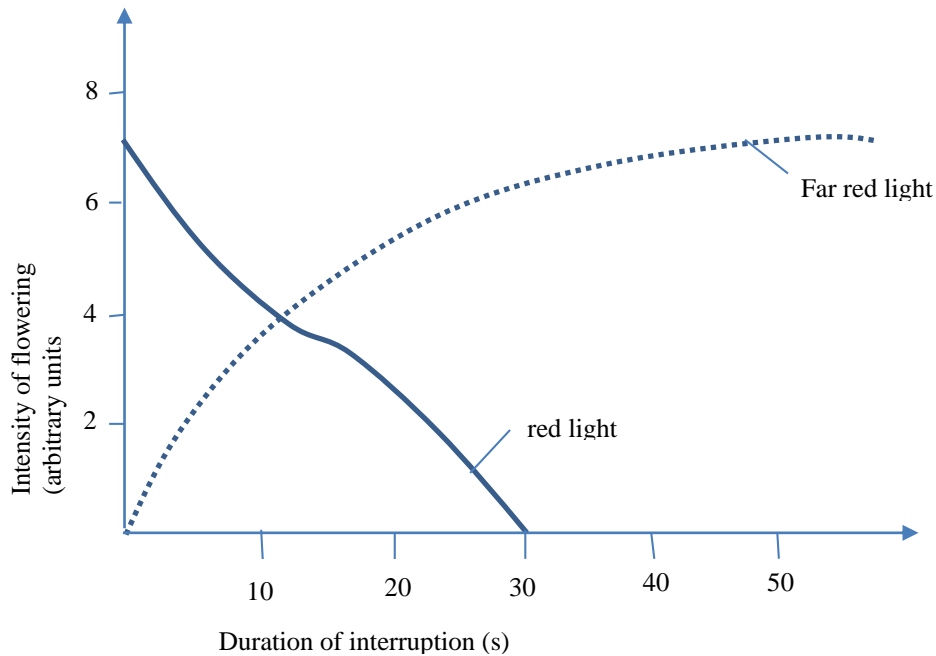


Fig.2

(a) What is the effect of interruption of the night period by each type of light?

(i) Red light

Generally, exposure to red light inhibits flowering to an extent dependent on the duration of interruption of the night period.

When exposed for 10s or less, red light rapidly reduces intensity of flowering.

Exposed for 10-30s, the intensity of flowering decrease gradually further to zero.

Exposed beyond 30s, flowering does not occurs.

(ii) Far-red light

Exposure to far red light promotes flowering increasing with the duration of light interruption

(b) Suggest the type of plant that would exhibit responses to light treatments as show in figure 2.

Short plant because Pfr promote formation of Pr that promotes flowering in short day.

(c) How can the knowledge of the effect of red light and far-red light on flowering be utilized in commercial growing of flowers?

Red light and far-red light stimulate flowering in long day and short- day plants respectively, thus the two types of lights can be used to enhance flower harvest in different plant types.

42. figure 3 shows diagrams of two types of blood circulatory system A and B in animals. The arrows show the direction of blood flow.

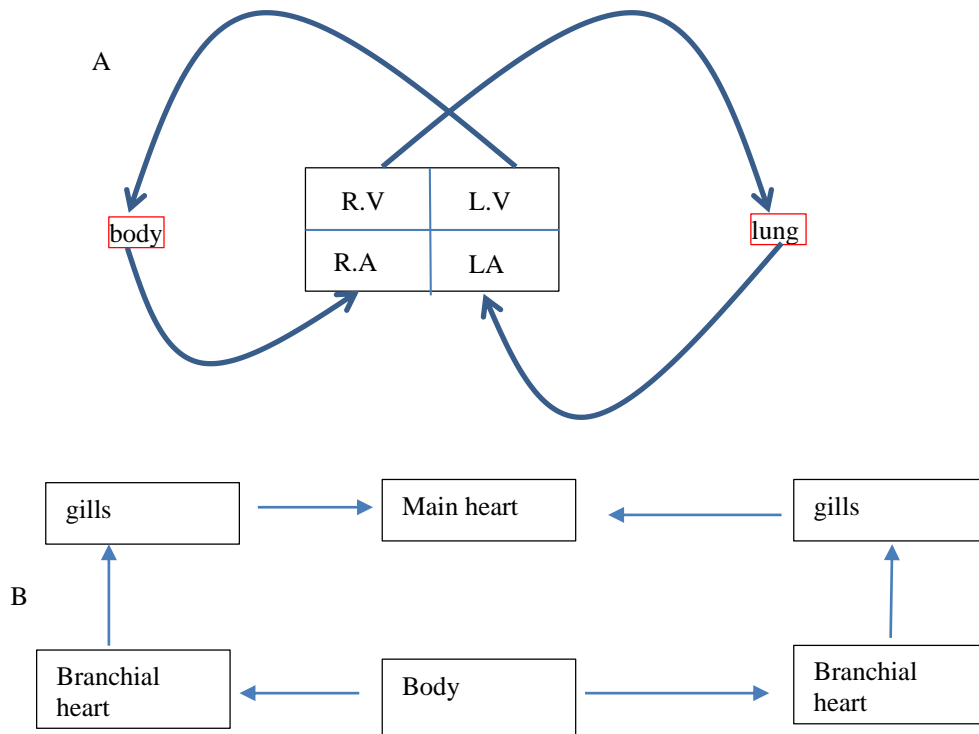


Fig.3

(a) Describe each circulatory system

(i) A

- Blood flows from the right atrium into right ventricle, from where it is pumped to the lungs

- It then flows to the left atrium and then into the left ventricle, from where it is pumped to the rest of the body.
- From the body blood returns to the heart through the right atrium
- The cycle repeats.

(ii) B

- From the heart, blood is pumped into the body, from where it flows to the branchial hearts on either side.
- The branchial hearts pump blood to the gills from where it returns to the main heart and the cycle repeats.

(b) How does each system maintain a high blood pressure?

(i) A

- In this double circulation system, the contraction of the heart muscles pumps the blood first to the lungs and then to the rest of the body in each circuit of the circulation. This ensures that pressure is restored in the blood after leaving the capillaries.

(ii) B

- The main heart's contraction generates sufficient pressure to push the blood through the vessels in the body
- The branchial hearts then maintain the pressure of the blood by continuing to pump the blood into the gills and back to the main heart.

(c) What is the advantage of maintaining a high blood pressure over a fluctuating pressure in a circulatory system of an animal?

- high blood pressure helps to propel blood at a high speed along the arteries to the body tissue. This facilitates faster delivery of oxygen and nutrients to the body tissues and removal of waste products from the body.

43. (a) Give one ecological importance of each of the following structural arrangements in plants

(i) Monoecious (02marks)

- Increases chances of pollination and seed production

(ii) Dioecious (02marks)

- Increases chances of genetic variation among offspring with increased chances of survival in different habitats.

(b) explain why

(i) in dioecious plants, plants are usually associated with dry soils while female plants are associated with moist soils (02 marks)

- Male plants are associated with dry soil to produce dry light pollen grains to be blown to stigma of female flowers while females prefer moist soils to allow their stigmas be moist and sticky to receive pollen grain and enable proper development of seeds.

(ii) nearly all dioecious plants are wind pollinated. (02marks)

- Male and female flowers occur on different distant plants thus wind pollination increases chances of pollination where the male plant produces a lot of pollen grain.

(c) Give one reason why dioecious plants are rarer than monoecious plants (02marks)

- Only half of the plants produce seeds

44. (a) State the importance of the following elements in plant metabolism.

(i) Calcium

- It activates several enzymes e.g. ATPase
- It is important for translocation of carbohydrate
- It is a constituent of the plant walls
- It is important in cell division and cell enlargement
- It plays an important role in lipid metabolism
- Development of root apex
- Detoxification of heavy metal ions

(ii) Magnesium

- It is a constituent of chlorophyll

- It activates enzymes in protein synthesis
- It is co-factor for many enzymes e.g. ATPase

(b) How does water logging of soil affect its nitrate content?

- It reduces the concentration of nitrates in the soil through dilution, leaching and reduced nitrification because oxygen level in the soil is reduced.

(c) Describe three special ways of obtaining essential by some plants growing in soils deficient of those elements.

- Some plants have mycorrhiza, an association of root and fungi; the fungi decompose humus into soluble nutrients (nitrogen and phosphorus) and also increases the surface area for their absorption by the roots. Plants that lack chlorophyll also obtain, carbohydrates and proteins from the fungi.
- Legumes such as peas, beans and soya bean have nitrogen fixing bacteria in their root nodules for fixation of nitrogen.
- Plants in nitrogen deficient are feed on insects to obtain nitrogen.
- Some plants are parasitic e.g. dodder plant

45 (a) State two human activities that increase the levels of carbon dioxide in the atmosphere.

- Burning fossil fuel
- Burning bushes and firewood
- Deforestation
- industrialization

(b) What is effect of high levels of each of the following gases in the atmosphere?

(i) Carbon dioxide

- Promotes photosynthesis in plants
- Dissolves in and reduces pH of rain water
- Leads global warming

(ii) sulphur dioxide.

- Acidic gas
 - Acidic rain
 - Acidic soil
- These damages trees, lichen, skin and causes death of aquatic organisms.

(c) State an indicator in the environment where there is prevalence of high levels of sulphur dioxide in the atmosphere.

- Disappearance of lichen and mosses
- Discoloration and damage to building, sculptures and fabric
- Chlorosis and necrosis of vegetation

46. In *Drosophila* the gene for broad abdomen and long wings are dominant over the genes for narrow abdomen and vestigial wing, Pure breed strains of double dominant variety were crossed with a double recessive variety and a test cross was carried out on F1 generation.

(a) Using suitable symbols, work out the expected phenotypic ratio of the test cross of F1 generation if the genes for abdomen width and length of the wing are linked. (07marks)

Let N and n represent alleles for broad body and narrow body respectively

Let A and a represent alleles for long and vestigial wings respectively

F1 genotype NnAa

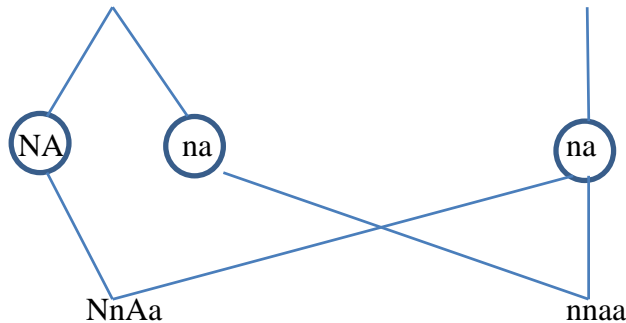
Test cross

Parents phenotype: Broad body, long wing x Narrow body, vestigial wing

Parent genotype: NnAa x nnaa

Meiosis

Gametes



F1 phenotype

NnAa

nnaa

F1 phenotype: Broad body, long wing x Narrow body, vestigial wing

F1 phenotype ratio 1

1

(b) It was however observed that when the test cross of the F1 generation was carried out the following results were obtained

Broad abdomen, long wing	380
Narrow abdomen, vestigial wing	396
Broad abdomen, vestigial wing	14
Narrow abdomen, long wing	10

Calculate the distance in unit between the genes for abdomen with and length of wing

$$\text{Cross over value} = \frac{14+10}{380+396+14+10} \times 100\% = 3\%$$

Hence the distance between the genes for abdomen size and wing length is 3units