RAMAKRISHNA MISSION VIVEKANANDA CENTENARY COLLEGE, RAHARA, KOLKATA

Undergraduate Admission Test 2023: Microbiology Honours

Full Marks : 75 **Time : 1 hour**

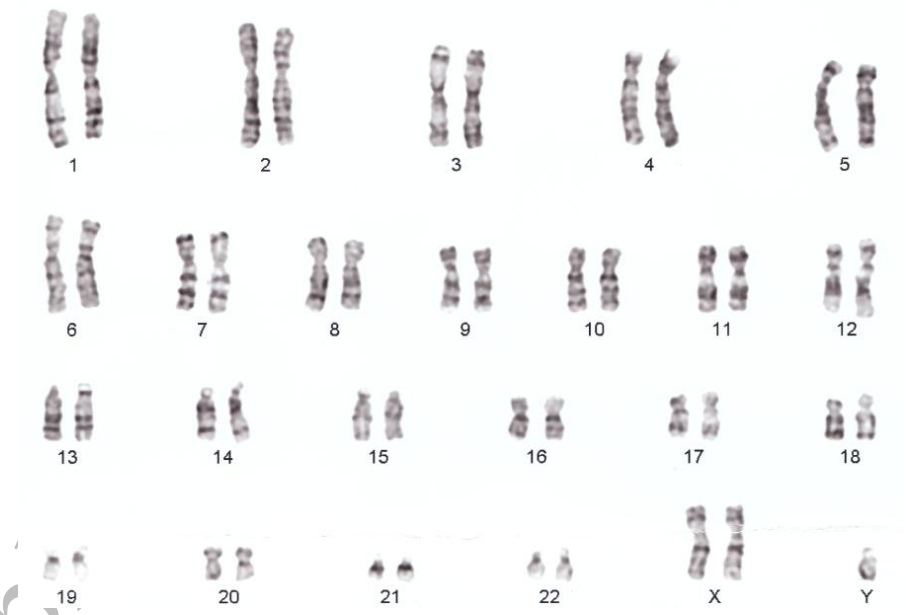
1. Individuals with obstructed bile ducts develop malnutrition because:

A. bile acids solubilize fat globules by dispersing them into micelles, easily accessed by lipases for digestion, followed by absorption.
B. bile acids are required for the efficient intestinal absorption of vitamins A, D, E, and K.
C. bile acids are responsible for activity of intestinal protease, thus digestion of dietary proteins.
D. all of them.

Among the above statements:

a) Only A & B are true
b) Only B & C are true
c) Only A & C are true
d) Only D is true

2. Identify the syndrome from karyotype of the individual



a) Down syndrome
b) Turner syndrome
c) Klinefelter syndrome
d) Insufficient informatin

3. In humans, hemophilia is caused by an X-linked recessive gene. A woman who is a nonbleeder - that is, she does not display the blood-clotting irregularities associated with hemophilia - had a father who was a hemophiliac. She marries a nonbleeder, and they plan to have children. Calculate the probability of development of hemophilia in the female and male offspring.

a) Male – 0, Female - 0
b) Male – $^1/_4$, Female - $^1/_2$
c) Male – $^1/_2$, Female - 0
d) Male – $^1/_2$, Female - $^1/_2$

4. Identify the correct matching for the gastrointestinal hormones: -

A	Gherlin	(i)	secretion of pepsinogen, increase intestinal motility
B	Gastrin	(ii)	increases intestinal secretion of water and electrolytes
C	Cholecystokinin	(iii)	stimulated in fasting state ("hunger hormone")
D	Vasoactive intestinal polypeptide	(iv)	gallbladder contraction; secretion of pancreatic enzymes

a) A – (iii), B – (iv), C – (ii), D – (i)
b) A – (ii), B – (i), C – (iv), D – (iii)
c) A – (i), B – (iii), C – (ii), D – (iv)
d) A – (iii), B – (i), C – (iv), D – (ii)

5. Match the correct pair–

A	Allopatric speciation	(i)	The evolution of a new species from a surviving ancestral species while both continue to inhabit the same geographic region.
B	Sympatric speciation	(ii)	Speciation in which a new species is formed from an isolated smaller peripheral population
C	Peripatric speciation	(iii)	Speciation that occurs between geographically isolated populations
D	Parapatric speciation	(iv)	Speciation within a population where subpopulations are reproductively isolated

a) A – (i), B – (iii), C – (ii), D – (iv)
b) A – (iii), B – (i), C – (ii), D – (iv)
c) A – (ii), B – (iv), C – (i), D – (iii)
d) A – (iii), B – (ii), C – (i), D – (iv)

6. Read the statements and find out the correct one :-

a) The evolution of fish began about 530 million years ago during the Cambrian explosion. It was during this time that the early chordates developed the skull and the vertebral column, leading to the first craniates and vertebrates. The first fish lineages belong to the Gnathostomata.
b) The invertebrate paleontology refers that; Arthropoda is a most diverse group and having up to 10 million species. The evolutionary ancestry of arthropods dates back to the Cambrian period. The group is generally regarded as monophyletic. This also suggests that, the members of Arachnida & Crustacea are also monophyletic in respect of their recent ancestor.
c) There are two different forms of mature cnidarians – Polyp and medusa. Polyp is hydroid form, sessile with mouth-up orientation. The medusa is bell or umbrella shaped with mouth down alignment.
d) The origin of the Dinosaur lies about 310 – 320 million years ago, in the steaming swamps of the late Carboniferous period, when the first reptiles evolved from advanced reptiliomorphs. Dinosaurs are a diverse group of reptiles of the clade Dinosauria.

7. Read the statements and find out the wrong one for Photosynthesis.
   a) The dark reactions comprise a complex cycle of enzyme-mediated reactions which catalyzes the reduction of carbon dioxide to sugar.
   b) Light reaction is a photochemical phase occurs during day time & Dark reaction is a Biochemical phase occurs during night but affected by light.
   c) During light reaction, oxygen is evolved and assimilatory power (ATP and $NADPH_2$) are formed. During dark reaction assimilatory power is utilized to synthesize glucose.
   d) To synthesize one glucose molecule Calvin cycle requires $6CO_2$, 18 ATP and 12 $NADPH_2$ sac with one egg cell, two polar cells, three antipodal cells and two synergids.

8. Match the statements:-

A	Indole 3 acetic acid	(i)	This biochemical molecule presents in Raw Coconut water and also serve as Plant Growth Regulator.
B	Gibberelic acid	(ii)	This gaseous chemical nearly similar in action as in calcium carbide water solution.
C	Cytokinin	(iii)	This phytochemical helps in phototrophic movement and apical dominance of stem.
D	Ethylene	(iv)	*de novo* Synthesis of the Enzyme-α-Amylase & seed Germination leads by this PGR.

   a) A – (i), B – (iii), C – (ii), D – (iv)
   b) A – (iii), B – (i), C – (ii), D – (iv)
   c) A – (ii), B – (iv), C – (i), D – (iii)
   d) A – (iii), B – (iv), C – (i), D – (ii)

9. Uricotelic animals are those -
   a) Who excrete nitrogenous wastes as uric acid in the form of pellet or paste with a minimum loss of water
   b) Who convert ammonia into uric acid and excrete in the form of pellet or paste with a sufficient loss of water
   c) Who convert ammonia into urea and released into the blood which is filtered and excreted out by the kidneys.
   d) Who excrete nitrogenous wastes as uric acid in the form of pellet or paste with a sufficient loss of water

10. Oxyhaemoglobin is haemoglobin bound to oxygen. Oxygen is transported in the form of oxyhaemoglobin from the lungs to different tissues. In the alveoli, oxyhaemoglobin formation is favoured by -
   a) High partial pressure of O_2, low partial pressure of CO_2, higher H^+ concentration and lower temperature
   b) High partial pressure of O_2, low partial pressure of CO_2, lesser H^+ concentration and lower temperature
   c) High partial pressure of O_2, low partial pressure of CO_2, lesser H^+ concentration and higher temperature
   d) High partial pressure of O_2, low partial pressure of CO_2, higher H^+ concentration and higher temperature

11. Read the statements and find out the correct one :-
    a) In fishes the heart pumps out oxygenated blood which is deoxygenated by the gills
    b) Amphibians and crocodiles have a 3-chambered heart with two atria and a single ventricle
    c) In birds and mammals, deoxygenated and oxygenated blood received by the left and right atria respectively passes on to the ventricles of the same sides
    d) In amphibians and reptiles, the left atrium receives oxygenated blood from the gills / lungs / skin and the right atrium gets the deoxygenated blood from other body parts

12. The following statements describe about the skeleton system in human, study them carefully and identify the wrong statement/(s) :-
    A. Axial skeleton comprises 80 bones distributed along the main axis of the body. The skull, vertebral column, sternum and ribs constitute axial skeleton.
    B. The bones of the limbs along with their girdles constitute the appendicular skeleton.
    C. The skull is composed of two sets of bones – cranial and facial, that totals to 22 bones. Cranial bones are 8 in number which form the front part of the skull and the facial region is made up of 14 skeletal elements they form the hard protective outer covering.
    D. The three bones – ilium, ischium and pubis are the part of coxal bone.

    a) Only A, B and C.
    b) Only B.
    c) Only C.
    d) All of these.

13. Study the following statements regarding absorption of water in plants and choose the right option /(s) :-
    A. Water is absorbed along with mineral solutes, by the root hairs, purely by diffusion.
    B. The apoplastic movement of water occurs exclusively through the intercellular spaces and the walls of the cells.
    C. During symplastic movement, the water travels through the cells – their cytoplasm; intercellular movement is through the plasmodesmata.
    D. Symplastic movement may be aided by cytoplasmic streaming.

    a) Only A.
    b) Only A and B.
    c) Only B and C.
    d) All of these.

14. Below some statements are given related to muscles in human. Study them carefully and choose the wrong option/(s).
    A. Based on their location, three types of muscles are identified: (i) Skeletal (ii) Visceral and (iii) Cardiac.
    B. The skeletal muscles have a striped appearance under the microscope and hence are called striated muscles.
    C. The visceral muscles do not exhibit any striation and are smooth in appearance. Hence, they are called smooth muscles.
    D. The cardiac muscles are non-striated and involuntary in nature as the nervous system does not control their activities directly.

    a) C and D only.
    b) A, B and C only.
    c) C only.
    d) D only.

15. Pick out the incorrect statement/(s) from the followings :-

A. Glucose exists in two different crystalline forms, alpha-D-glucose and beta-D-glucose.
B. alpha-D-glucose and beta-D-glucose are anomer in each other.
C. alpha-D-glucose and beta-D-glucose are enantiomer in each other.
D. Cellulose is a straight chain polysaccharide made of only beta-D-glucose units.
E. Starch is a mixture of amylose and amylopectin, both contain unbranched chain alpha-D-glucose unit.

a) A and B only.
b) C and D only.
c) C and E only.
d) D and E only.

16. Which of the following statement/(s) is / are correct?

A. Catalytic activity is lost when the co-factor is removed from the enzyme.
B. Coenzyme nicotinamide adenine dinucleotide (NAD) and NADP contains the vitamin niacin.
C. Biomacromolecules have a hierarchy of structures such as primary, secondary, tertiary and quaternary.
D. Enzymes lower the activation energy of reactions and enhance greatly the rate of the reactions.
E. Nucleic acids carry hereditary information and are passed on from parental generation to progeny.

a) A and E only
b) B and E only
c) B and C only
d) All of these

17. Suppose, a bacterium divides every 30 minutes. If a 100 ml culture contains 10,000 cells/ml initially, what will be the total number of cells in the culture after 180 minutes?

a) 180×10^4
b) 64×10^4
c) 6.4×10^7
d) 18×10^7

18. During protein translation, initiation involves recognition of the start codon (AUG) by initiator fmet-tRNA in the P-site of the ribosome. If the sequence of the mRNA is 5'-UUAAAC**AUG**UUAGGCCAG -3'. Which one of the following tRNA sequence will be the correct anticodon for the underlined codon in the mRNA.

a) 3'- ACGUGCGACGUA**AUG**GCUUGA -5'
b) 5'- ACGUGCGACGUA**CAU**GCUUGA -3'
c) 5'- ACGUGCGACGUA**UAC**GCUUGA -3'
d) 5'- ACGUGCGACGUA**CUA**GCUUGA -3'

19. Environmental stresses like drought, high-salinity and low temperature can lead to decreased water availability in plants. Plants in response turn on adaptive physiological responses involving changes in gene-expression. You have taken two similarly raised tomato plants except, one is maintained at 3 times the normal NaCl concentration found in the soil. Which among the following bio-synthetic processes is most likely to get upregulated under the above mentioned conditions.

a) 6-Benzylaminopurine bio-synthetic pathway
b) Ethylene bio-synthetic pathway
c) Abscisic acid bio-synthetic pathway
d) Gibberellic acid bio-synthetic pathway

20. A bacterial cell was transformed with a recombinant DNA that was generated using a human gene. However, the transformed cells did not produce the desired protein. Reasons could be -
a) Human gene may have intron which bacteria cannot possess.
b) Amino acid codons for humans and bacteria are different.
c) Human protein is formed but degraded by bacteria.
d) All the above

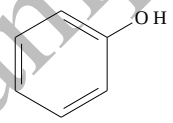
21. What will be the pH of the buffer solution obtained by mixing 50 ml 0.1 (N) CH_3COOH to 25 ml 0.1 (N) NaOH solution. (pKa of CH_3COOH is 4.74)
a) 7.4
b) 9
c) 2
d) 4.74

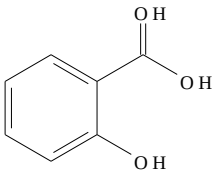
22. Which of the given arrangement is correct in terms of increasing polarity –
a) $C_6H_5F > C_6H_5Cl > C_6H_5Br > C_6H_5I$
b) $C_6H_5F < C_6H_5Cl < C_6H_5Br < C_6H_5I$
c) $C_6H_5F > C_6H_5Cl < C_6H_5Br < C_6H_5I$
d) $C_6H_5F > C_6H_5Cl < C_6H_5Br > C_6H_5$

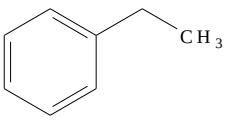
23. The hybridization state and shape of the molecule PCl_5 is _____ and _____ respectively
a) sp^3d, trigonal bipyramidal
b) sp^3d, planar
c) sp^3d^3, trigonal bipyramidal
d) sp^2, pentagonal

24. For a chemical reaction to be spontaneous, its change in free energy must be-
a) Negative
b) Positive
c) Zero
d) Equal to the product of that reaction

25. Benzene is treated with ethyl chloride in presence of anhydrous aluminium chloride. The main product of this chemical reaction will be -

a) 

c) 

b) 

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