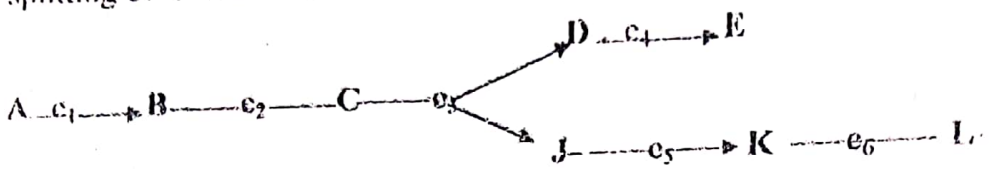
SECTION A (40 MARKS)

1. Figure 1 shows a series of metabolic reactions where enzyme e_3 catalyses the splitting of C into D and J.



Assume that product E is an allosteric effector that inhibits enzyme e_3 if product E were not consumed in a subsequent reaction which of the following would likely happen?

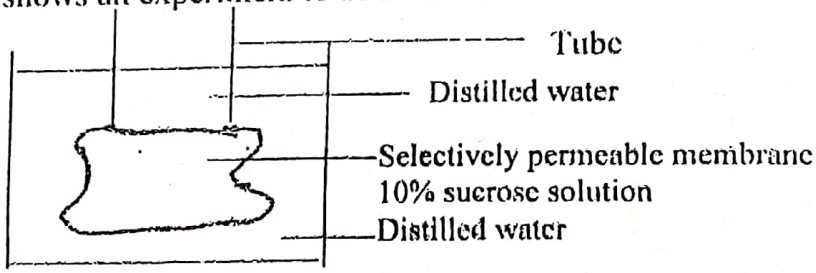
A. The rate of production of product D would increase

B. The rate of production of product E would increase

C. The rate of production of product J would increase

D. The rate of production of all products would decrease

2. Figure 2 shows an experiment to demonstrate osmosis



Which of the following results are expected from the experiment?

A. The water level in the tube will rise to a level above the water in the beaker.

B. The water level in the tube will drop to a level below the water in the beaker

C. There will be no change in the water level of the tube, and the water in the tube will remain pure

D. The concentration of the sucrose solution will increase

3. The movement of solutes across a plasma membrane from a region of higher solute concentration to a region of lower solute concentration with the aid of proteins is

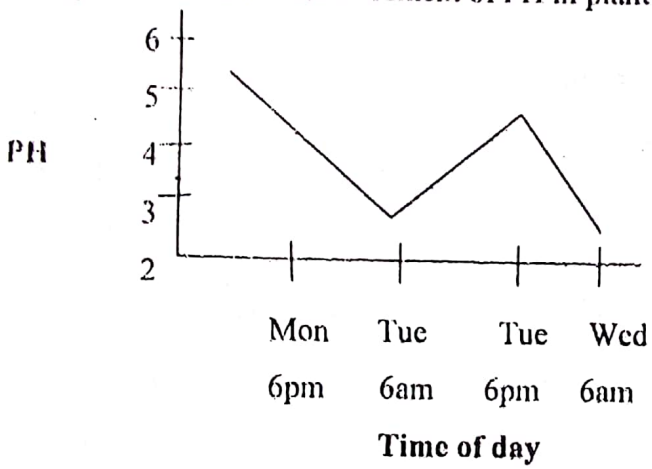
A. Active transport

B. bulk flow

C. osmosis

D. facilitated diffusion

4. Figure 3shows the measurement of PH in plant leaves during a 36 hour period.



The changes in PH over the 36 hour period could indicate that acid products were being produced.

A. at night

B. during the day

C. during the day and degraded at night

D. during the night and degraded during the day

5. Which one of the following compounds is produced by the reactions between carbondioxide and phophoenolpyruvate (PEP) in tropical plants such as sugar cane?

A. Malic acid

B. Phophoglyceric acid

C. Ribulose bisphosphate

D. Oxalo acetic acid

6. Which of the following molecules stores more energy than the rest?

A. ATP

B. NADPH

C. Glucose

D. Starch

7. A metabolic path way that involves movement of substances between two kinds of cells is

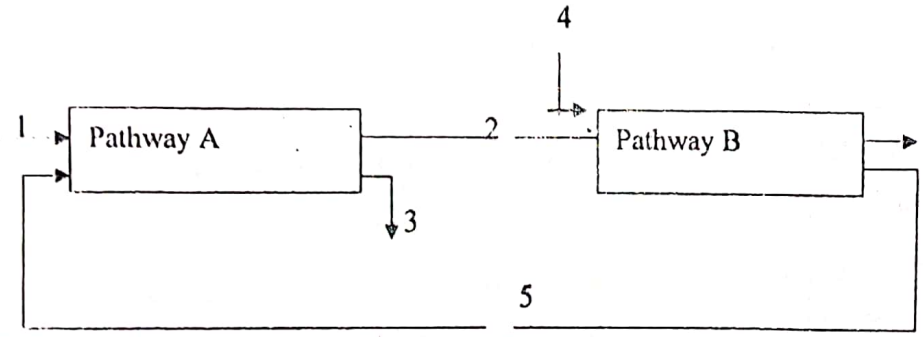
A. cyclic photophosphorylation

B. non cyclic photophosphorylation

C. C3 photosynthesis

D. C4 photosynthesis

8. Figure 4 shows the biosynthetic pathway in C3 photosynthesis



Which of these is represented by arrow 3?

A. NADPH

B. ADP

C. oxygen

D. electrons

9. Which of the following sequences correctly indicates the potential ATP yield of the indicated molecules from greatest ATP yield to least ATP yield?

A. Pyruvate, ethanol, glucose, acetyl CoA

B. Glucose, pyruvate, acetyl CoA, NADH

C. Glucose, pyruvate, NADH acetyl CoA

D. Glucose, $FADH_2$, acetyl CoA, pyruvate

10. Which of the following is the last step leacding up to muscle contraction that occurs just before a myofibril contracts?
    A. Tropomyosin exposes binding sites on actin
    B. ATP binds to myosin
    C. Sarcoplasmic reticulum releases Ca^{2+}
    D. ATP is converted to ADP+ PC

11. Storage and maturation of human sperm occurs in the
    A. epididymis
    B. interstitial cells
    C. sertoli cells
    D. vas deferens.

12. Among amniotes all the following are extra embryonic membranes except the
    A. allantois
    B. amnion
    C. chorion
    D. embryonic disc

13. Oogenesis in humans begins
    A. during embryonic development
    B. at birth
    C. at puberty
    D. at maturity

14. The function of the acrosome in the sperm head is to
    A. provides ATP for flagellar movements
    B. control DNA replication in the sperm
    C. store enzymes used for penetrating the egg during fertilization
    D. enclose the genetic material

15. Nitrogen becomes available to plants by all of the following processes except

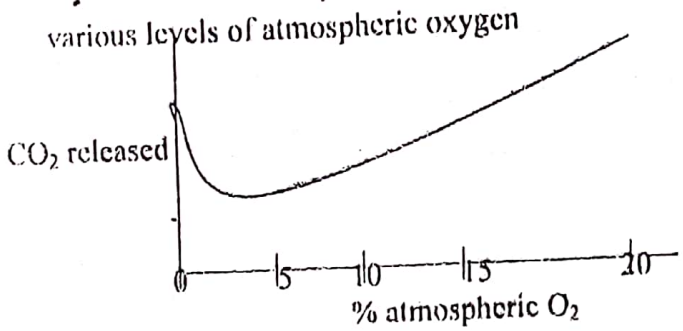
A. ammonification

B. denitrification by denitrifying bacteria

C. nitrification by nitrifying bacteria

D. nitrogen fixation in plant nodules

16. Figure 5 shows the amount of Carbon dioxide that is produced by plant cells at various levels of atmospheric oxygen



At levels of atmospheric O_2 below 1% the amount of CO_2 released is relatively high. This is probably because.

A. acrobic respiration rate is very high

B. oxygen is being converted to water

C. alcoholic fermentation is taking place

D. photosynthesis cannot function at night

17. If a cell has 46 chromosomes at the beginning of meiosis, then at anaphase I there would be a total of

A. 23 chromatids

B. 23 chromosomes

C. 46 chromosomes

D. 46 chromatids

18. In typical cell division all the following contribute to genetic variation except

A. anaphase of mitosis

B. anaphase of meiosis I

C. prophase of meiosis I

D. crossing over

19. In snapdragons, the allele for tall plants (**T**) is dominant to the allele for dwarf plants (**t**) and the allele for red flowers (**R**) is co dominant with the allele for white flowers (**W**). The heterozygous condition for flower color is pink (**RW**)

If a dwarf red snapdragon is crossed with a white snapdragon homozygous for tall, what are the probable genotypes and phenotypes of the F1 generation?

A. tall and pink

B. tall and red

C. tall and white

D. dwarf and red

20. Four genes **J, K, L** and **M** are located on the same chromosome. Given that the COV between **K** and **J** is 3, between **K** and **L** is 8, between **J** and **M** is 12, and between **L** and **M** is 7. What is the order of the genes on the chromosome?

A. JKLM

B. JKML

C. KJLM

D. KJML

21. The inheritance of skin colour in humans is an example of

A. pleiotropy

B. co dominance

C. Epistasis

D. Polygenic inheritance

22. The genes **A** and **B** are linked. An individual who is **Aa Bb** produces equal numbers of four gametes **AB, Ab, aB** and **ab**. The best explanation for this would be that the

A. genes are on homologous chromosomes

B. genes are on non homologous chromosomes

C. two genes are close together on the same chromosomes

D. two genes are separated by a large distance on the same chromosome

23. A human genetic defect that is caused by non disjunction of the sex chromosome is
A. sickle- cell anaemia
B. haemophilia
C. Downs syndrome
D. Turners syndrome

24. The two strands of a DNA molecule are connected by
A. hydrogen bonds between the codons and anticodons
B. hydrogen bonds between the bases of one strand and the bases of the second strand
C. hydrogen bonds between deoxyribose sugar molecules of one strand and deoxyribose molecules of the second strand
D. covalent bonds between phosphate groups

25. The end products of translation are
A. polypeptides
B. amino acids
C. lipids
D. ribonucleic acid

26. Which of the following contains a code for a protein?
A. DNA polymerase
B. RNA polymerase
C. ribosomal RNA
D. messenger RNA

27. A population consists of 9% white sheep and 91% black sheep. What is the frequency of the black wool allele if the black wool allele is dominant and that for white wool is recessive?

A. 0.09

B. 0.3

C. 0.43

D. 0.7

28. All the following are homologous structures except a

A. bat wing

B. bird wing

C. butterfly wing

D. human arm

29. In C4 plants most carbon dioxide fixation occurs in which of the following

A. Spongy mesophyll

B. Palisade mesophyll

C. Epidermis

D. Bundle sheath cells

30. The ripening of fruit is promoted by

A. Abscisic acid

B. Cytokinins

C. ethylene

D. gibberellins

31. All of the following are found in both roots and stems except

A. Casparian strip

B. Primary phloem

C. Primary xylem

D. Secondary xylem

32. When stomata are open in C_3 plants one would likely find

A. the guard cells are relaxed

B. the environment is excessively hot and dry

C. a low concentration of K^+ in the guard cells

D. low carbon dioxide levels in the leaf

33. Which of the following would normally contain blood with the least amount of oxygen? The

A. left vertebrate

B. left atrium

C. pulmonary vein

D. pulmonary arteries

34. Systolic blood pressure is maintained by the

A. left atrium

B. right atrium

C. left ventricle

D. right ventricle

35. Which of the following initiates an attack against a specific antigen or pathogen?

A. Complement

B. Lysozyme

C. Macrophage

D. Plasma cells

36. What occurs in neurons during the refractory period following an action potential?

A. ATP is regenerated from ADP+ Pi

B. Na^+ more across the neuron membrane from inside to outside

C. K^+ moves across the neuron membrane from inside to outside

D. Na^+ on the inside and K^+ on the outside exchange places across the neuron membrane.

37. The part of the seed that protects the seed from dryness, salt water and other adverse environmental conditions is called the

A. seed coat
B. radical
C. endosperm
D. sepal

38. Special proteins that can bind to antigens on the surface of a pathogen and help to destroy it are

A. lymphocytes
B. plasma cells
C. antibodies
D. phagocytes

39. The chances of an egg being fertilized are greatest during

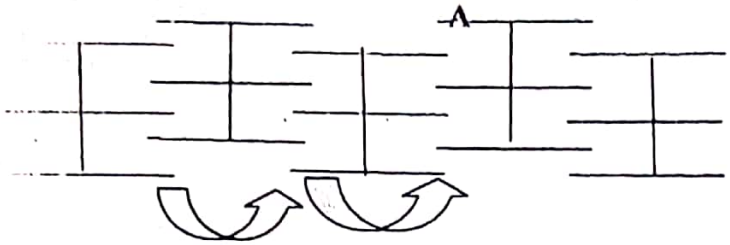
A. ovulation
B. menstruation
C. the follicle phase
D. the luteal phase

40. The cluster of cells that surround a single ovum and prepares it for ovulation is the

A. ovary
B. fallopian tube
C. primary follicle
D. uterus

SECTION B (60 MARKS)

41. Figure6represents a longitudinal section through part of a striated muscle



a) Label the parts **A**, **B** and **C** on the diagram

A..... (03 Mark)

B.....

C.....

b) State which one of these parts

(i) contains actin but not myosin

..... (01 mark)

(ii) shortens when the muscle constructs

.... (01 mark)

c) Describe the part played by each of the following in muscle contraction

(i) ATP (03 marks)

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(ii) Calcium ions 02 marks)

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42.Figure7shows changes in height with age of boys and girls in the first 20 years of life and their growth rate.

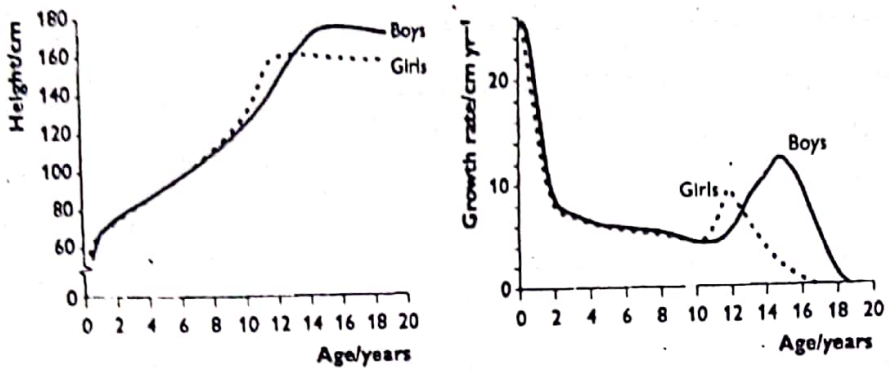

Fig.7

a) Compare the variation in growth in height in boys and girls with age.(03 marks)

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b) Compare the change in growth rate with age in boys and girls (03 marks)

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c) Explain how the growth spurts seen in the growth rates are brought about (02marks)

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d) State any **two** changes that occur in the period when the growth spurts occur in

(i) **Boys** (01 mark)

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(ii) **Girls** (01 mark)

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43. The production of starch by leaves was investigated by removing discs from a destarched leaf. The discs were divided between four flasks **A, B, C** and **D**. and treated as shown in Table 1.

Each flask was kept in air .After 36 hours the discs were tested for the presence of starch.

Flask	Fluid contents of flasks	Conditions in which flask were kept	Results of testing for starch
A	Water enriched with CO_2 and kept at 25^0C	Light	Present
B		Dark	Absent
C	Glucose solution enriched with CO_2 kept at 25^0C	Light	Present
D		Dark	Absent

a) (i) which flasks served as the control experiment (01 mark)

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b) Explain why the following were done in the experiment

(i) Enriching glucose and water with carbon dioxide (02 marks)

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(ii) Experiments were kept at the same temperature (02 marks)

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(iii) The flasks were all kept in air (01 mark)

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(iv) Destarched leaves were used (01 mark)

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c) Explain the results shown in flask A (03 marks)

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44.a)Suppose that out of a sample population of 650 rabbits researchers find 39 that express a recessive allele (s) for short ears. Assuming there are only two allele for ear length in the populations how many rabbits are homozygous for long ears (SS) and how many are heterozygous ifthe population is in Hardy Weinberg equilibrium (04 marks)

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a) State **three** conditions that have to be met to maintain this population in Hardy Weinberg equilibrium (03 marks)

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d) Explain why small populations are unlikely to attain Hardy Weinberg equilibrium (03 marks)

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45.a) Explain the key differences observed between human male and female gametes in relation to

(i) The size of gametes (02 marks)

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(ii) The number of gametes produced (02 marks)

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(iii) Motility of gametes (02 marks)

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b)Describe **one** benefit and **three** costs in providing for internal development of an embryo(04 marks)

i) **Benefit**.....

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ii) Costs.....

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46. Disruption of essential nutrient cycles by human activities can have serious environmental consequences

(a) Explain this statement in relation to the

(i) Nitrogen cycle (04 marks)

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(iii) Carbon cycle (03 marks)

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(b) Describe the role of micro organisms in the

(i) carbon cycle (01 mark)

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(ii) Nitrogen cycle (02 marks)

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E N D