

**Indian Association of Teachers in Biological Sciences**  
**NATIONAL STANDARD EXAMINATION IN BIOLOGY 2018-2019**

Date of Examination : 25<sup>th</sup> November 2018

Time : 02 : 00 pm to 04 : 00 pm

[Ques. Paper Code : B221]

(Total Marks : 240)

1. Green world hypothesis suggests that despite many primary consumers feeding on plants, the terrestrial ecosystems maintain their greenery. The herbivores are able to consume only a small part of plant biomass because of several inhibiting factors. Some of the factors are listed below :

1. Plants have defences against herbivores.
2. Abiotic factors limit herbivore feeding.
3. Disturbances in breeding cycle limit herbivore feeding.
4. Intraspecific competition limits herbivore feeding.

Which of the following is true ?

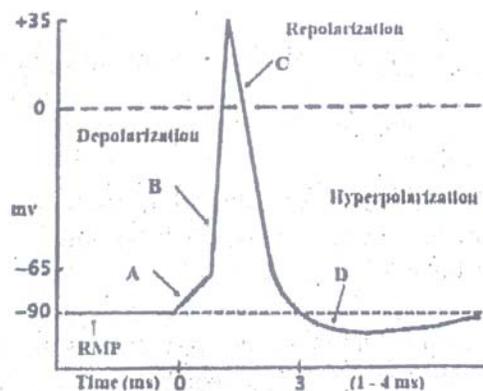
- (a) Statements 1, 2 and 3 are the inhibiting factors
- (b) Statements 1, 2 and 4 are the inhibiting factors
- (c) Statements 1, 3 and 4 are the inhibiting factors
- (d) Statements 2, 3 and 4 are the inhibiting factors

**Ans.** [b]

**Sol.** Number of plants producer remain constant due to presence of defence mechanism is plant with limiting environmental abiotic factor.

Ans. (b) 1, 2, 4 are correct.

2. Match the alphabets (A, B, C and D) with the events (i, ii, iii and iv) seen during action potential.



(i) Voltage gated  $K^+$  channels remain open after the potential reaches resting level.

(ii) Closure of  $Na^+$  and opening of  $K^+$ , voltage gated channels.

(iii) Local potential change, depolarization to threshold

(iv) Opening of voltage gated  $Na^+$  channels

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

**Ans.** [b]

- Sol.** (iii) Local potential change, depolarization to threshold  
(iv) Opening of voltage gated  $\text{Na}^+$  channels  
(ii) Closure of  $\text{Na}^+$  and opening of  $\text{K}^+$  voltage gated channels  
(i) Voltage gated  $\text{K}^+$  channels remain open after the potential reaches resting level

3. The first groups of animals to develop a lung adequate to support their respiratory requirements without use of supplementary organ for gaseous exchange were;

- (a) amphibians                      (b) reptiles                      (c) mammals                      (d) aves

**Ans.** [b]

**Sol.** Reptiles are first group of animals to develop a lung adequate to support their respiratory requirement without use of supplementary organ for gaseous exchange.

4. With respect to keratin, which of the following is **NOT** a correct statements ?

- (a) It is a structural protein of hair, wool, nails, claws, beaks and feathers  
(b) It is a component of vertebrate skin  
(c) It is a globular protein that protects animals body from external injuries  
(d) Its hardness vary with the degree of cross linking by disulphide bridges between neighbouring chains.

**Ans.** [c]

**Sol.** Keratin protein is the structural protein of hair, wool nails, claws, breaks and feathers. It is also component of vertebrate skin its hardness vary with the degree of cross linking by disulphide bridges between neighbouring chains.

5. Spina bifida is a congenital defect of the vertebral column. An increased risk of this defect is primarily associated with level of

- (a) Vitamin A                      (b) Vitamin B                      (c) Vitamin C                      (d) Vitamin E

**Ans.** [b]

**Sol.**

6. With respect to mitochondria and chloroplast which of the following statements is **NOT** true ?

- (a) They possess a circular' chromosome  
(b) They reproduce within the cell  
(c) They divide at the same time as the cells in which they are situated divide  
(d) They employ chemiosmotic energy transduction to fuel the biochemical reactions that take place within their structures

**Ans.** [c]

**Sol.** Division of mitochondria and chloroplast may be independent of cell division.

7. The presence of homologous structure in two different organisms, such as radius and ulna in forelimb of a human and a bat, indicates that-

- (a) humans and bats are polyphyletic species  
(b) the evolution of human and bat is convergent  
(c) humans and bats form a monophyletic clade  
(d) humans and bats did not evolve from a common ancestor

**Ans.** [c]

**Sol.** Homologous organs are result of divergent evolution therefore human and bats form a monophyletic clade.

8. Tattooing is a permanent coloration of the skin in which a foreign pigment is deposited with a needle into the .....
- (a) epidermis                      (b) dermis                      (c) hypodermis                      (d) connective tissue

**Ans.** [b]

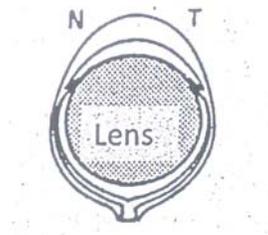
**Sol.** Tattooing is a permanent coloration of the skin in which a foreign pigment is deposited with needle into the dermis.

9. An angiosperm 'A' and a gymnosperm 'G' have 100 chromosomes in the cells of their meristem. What would be the correct number of chromosomes in the endosperms of the seeds of A and G?
- (a) A = 300; G = 300      (b) A = 200; G = 200      (c) A = 100; G = 300      (d) A = 300; G = 100

**Ans.** [d]

**Sol.** In angiosperms endosperm is  $(3n)$  & in gymnosperm it is  $(n)$  so  
 Angiosperm (A)  $\Rightarrow$  300  
 Gymnosperm (G)  $\Rightarrow$  100

10. Schematic eye is represented in the figure. Which of the following statements is true ?



- (a) It shows adaptation for acquiring maximum dim light  
 (b) It peculiarly shows high resolution power of retina  
 (c) It represents a typical diurnal animal  
 (d) Small distance between the retina and lens permits projection of larger and clearer image.

**Ans.** [a]

**Sol.** During dim light sympathetic Nervous system dilate the pupil.

11. A bone scan is a diagnostic tool where small amount of a radioactive tracer compound is injected intravenously and the degree of uptake of the tracer is measured by a scanning device. Normal bone tissue is identified by a consistent grey colour. Darker or lighter areas also known as "Hot spots" and "Cold spots" respectively may indicate bone abnormalities. By considering this fact, which of the following conditions would produce hot spots on X ray sheet?

- (a) Decalcified bone  
 (b) Paget's disease (disease that disrupts displacement of old bone tissue with new).  
 (c) Bone cancer  
 (d) Degenerative bone diseases

**Ans.** [c]

**Sol.** Bone scan is used to detect bone cancer.

12. There are two forms of UV radiations, UVA (315–400 nm) & UVB (280 – 315 nm) that have different effects on health. Which of the following statements is true ?
- UVA is not absorbed by the ozone layer and is responsible for tanning.
  - UVB is not absorbed by the ozone layer and is germicidal in action
  - UVA is most absorbed by ozone layer and is responsible for cataract formation
  - UVA is not absorbed by ozone layer and is responsible for sun burn and skin cancer

**Ans.** [a]

**Sol.** UV is least harmful in all 3 UV radiation causes tanning of skin.

13. Select the correct match for items in part A to that in part B among the following :

**PART A**

**PART B**

- |  |  |
|--|--|
| (P) Receptor mediated endocytosis        | (i) Entry of maternal antibodies across placenta |
| (Q) Phagocytosis                         | (ii) Entry of HIV in helper T cell               |
| (R) Bulk phase endocytosis / Pinocytosis | (iii) Vital defence mechanism                    |
| (S) Transcytosis                         | (iv) Absorptive cells of kidneys & intestine     |
| (a) P-ii, Q-i, R-iii, S-iv               | (b) P-i, Q-ii, R-iv, S-iii                       |
|  | (c) P-ii, Q-iii, R-iv, S-i                       |
|  | (d) P-iii, Q-iv, R-ii, S-i                       |

**Ans.** [c]

**Sol.** P(ii), Q(iii), R(iv), S(i)

14. Structural features of two types of cells; P and Q of vascular tissue of a dicot plant are given below;  
 P :- Presence of nucleus, membrane bound organelles and large number of mitochondria  
 Q :- No nucleus, cytoplasm is in the form of thin layer, few small mitochondria, no ribosomes, no Golgi bodies.

Cells P and Q are :

- P–xylem parenchyma; Q–xylem trachieds
- P–companion cell; Q–Phloem fibres
- P–Companion cells; Q–sieve tube elements
- P–companion cell; Q–Xylem parenchyma

**Ans.** [c]

**Sol.** Nucleus is present in compainian cell & absent in sieve tube element.

15. The products of hydrolysis of chitin which is a major component of exoskelelton of insects is;
- galactosamine which is an amino sugar
  - glucosamine which is an amino sugar
  - deoxyribose sugar which is a pentose sugar
  - fatty acids and glycerol

**Ans.** [b]

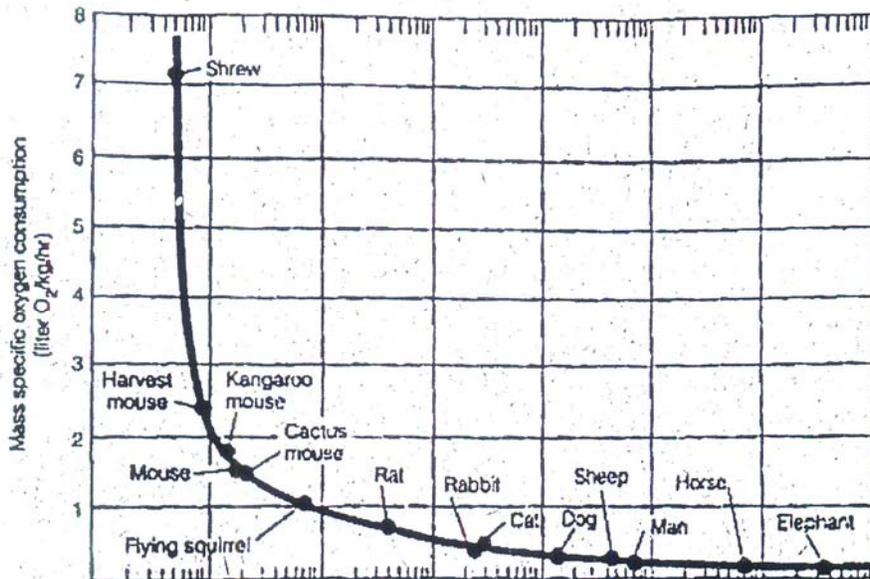
**Sol.** Chitin is polymer of NAGA (N-Acetylalgalactosamine)

16. White coat color in guinea pigs is recessive (b) to black (B). Ovary from black homozygous guinea pig is transplated into a white ovaectomized female. If this white female is mated with a white the offspring will be,
- black with the genotype BB
  - white with the genotype bb
  - black or white with genotype Bb OR bb
  - black with the genotype Bb.

**Ans.** [d]

**Sol.** Female overy is homozygous black (BB) and male is white (bb) so offspring will be Bb.

17. In the context of the following figure, which of the statements below is true ?



- (a) Mass specific metabolic rate decreases with increased activity  
 (b) Mass specific metabolic rate increases with decreasing body mass  
 (c) Mass specific metabolic rate increases with decreased area/volume  
 (d) Mass specific metabolic rate decreases with increases in food consumption rate

Ans. [b]

Sol. Mass specific metabolic rate increase with decreasing body mass

18. Kangaroo rat is a xeric vertebrate which has higher metabolic rate than lizards. It usually does not drink water. Which of the following features is **NOT** shown by this mammal ?
- (a) It produces highly concentrated urine  
 (b) It shows lower basal metabolic rate than a non-desert mammal  
 (c) It utilises metabolic water and spends the day in burrows which have temperature of 25°C  
 (d) It has cutaneous permeability to absorb moisture from the damp burrows during day and from cold sand at night.

Ans. [d]

Sol. Kangaroo rat have xerophytic habitat produce highly concentrated urine, low BMR, lives in burrows.

19. Glyoxysomes are single membrane-bound cytoplasmic organelles in eukaryotes. Which of the following statements is **NOT** true for glyoxisomes?
- (a) glyoxysomes are specialised type of peroxisomes  
 (b) they play a major role in the mobilisation and utilisation of stored nutrients in germinating seeds  
 (c) they are found in vertebrates liver and play a major role in converting glucose to glycogen  
 (d) they play a major role in the conversion of fatty acids in to carbohydrates

Ans. [c]

Sol. Glyoxysome is feature of plant cell present in germinating seed, absent in animal cells.

20. The diagram below represents the digestive system from ..... group of animals.



- (a) ruminant herbivore  
(b) non-ruminant herbivore  
(c) bird  
(d) carnivore animal

Ans. [b]

Sol. Correct option b

21. When a small piece of fresh liver is dropped into a beaker of hydrogen peroxide solution, it results in rapid generation of gas bubbles. This can be attributed to :

1. action of an enzyme catalase that breaks down  $H_2O_2$  into  $H_2O$  and  $O_2$
2. action of peroxisomes in hepatocytes, whose enzymes break down  $H_2O_2$  to release oxygen.
3. Increased  $H_2O_2$  production by superoxide dismutase activity in peroxisomes.
4.  $H_2O_2$  acting on glycogen from liver cells releasing  $CO_2$

- (a) 1 and 2                      (b) 4 only                      (c) 3 only                      (d) 2 and 3

Ans. [a]

Sol. Liver having maximum number of peroxisomes involve is detoxification by the help of catalase enzyme

22. Function of non-kinetochore microtubules is ;

- i. To help the chromosomes to get arranged at the equator .
- ii. To elongate the cell during anaphase.
- iii. To help the separation of chromatids during anaphase

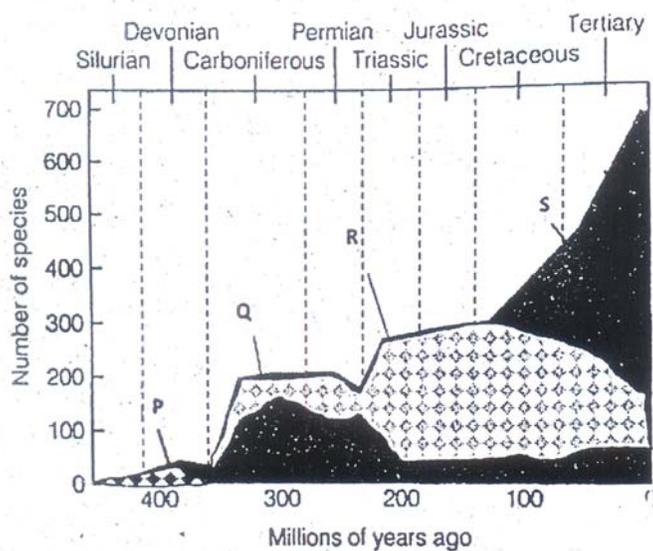
Which of the statements/s is/are correct?

- (a) i only                      (b) ii only                      (c) iii only                      (d) i and iii

Ans. [b]

Sol. Non kinetochore are direct spindle fiber never involve is chromosomal moment just maintain cell structure.

23. The diagram below represents pattern of expansion and reduction of major terrestrial groups identified as P, Q, R and S during the 400 million years of plant evolution. If S represents Angiosperms, P, Q and R respectively represent.



- (a) P - Pteridophytes, Q - Psilopsids, R - Gymnosperms  
 (b) P - Gymnosperms, Q - Psilopsids, R - Pteridophytes  
 (c) P - Pteridophytes, Q - Gymnosperms, R - Psilopsids  
 (d) P - Psilopsids, Q - Pteridophytes, R - Gymnosperms

**Ans.** [d]

**Sol.** Order of evolution is Psilopsida → Pteridophyta → Gymnosperm → Angiosperm

24. If photosynthesizing algal cells are provided with CO<sub>2</sub> with heavy isotope of oxygen (<sup>18</sup>O<sub>2</sub>); which of the following, produced by the algae will NOT contain <sup>18</sup>O<sub>2</sub> ?

- (a) FGA (b) PGAL (c) Glucose (d) O<sub>2</sub>

**Ans.** [d]

**Sol.**  $6\text{CO}_2^{18} + 12\text{H}_2\text{O} \rightarrow 6\text{C}_6\text{H}_{12}\text{O}_6^{18} + 6\text{O}_2 + 6\text{H}_2\text{O}^{18}$

Intermediate products of calvin cycle will have O<sup>18</sup>

25. Which of the following statements about allosterically regulated enzymes is correct ?

- (a) Activator binds to the active site of an enzyme  
 (b) Inhibitor binds to the active site of an enzyme  
 (c) Activator binds to the active sites and stabilise the active form of an enzyme  
 (d) Activator binds to the regulatory site of an enzyme and stabilizes the active form

**Ans.** [d]

**Sol.** Allosteric modulation includes the regulation of enzyme activity regulation by modulator that binds with regulatory site and stabilize the active site or change the active site in allosteric inhibition.

26. The following four sites (a - d) were being considered for the construction of an international airport. The species composition of the four sites are given below. Construction on which of the sites (a, b, c and d) will not take a huge toll on biodiversity ?

Site	Number of species in various categories				
	Least concern	Uncertain status	Rare	Endangered	Endemic
a	58	11	02	00	05
b	103	20	01	00	01
c	49	00	02	02	14
d	126	09	04	07	08

**Ans.** [b]

**Sol.** Rare Endemic species are more concerned to notice the biodiversity of an ecosystem which one is expressed by option b.

27. Which of the following features are mostly observed in self pollinating flowers ?

- i. Inconspicuous flowers  
 ii. Presence of nectaries  
 iii. No fragrance  
 iv. Short style  
 v. Versatile anthers

- (a) i, iii and iv (b) only iii (c) ii and iv (d) iv and v

**Ans.** [a]

**Sol.** Fragrance, Nectaries & versatile anther required for cross pollination.





32. A cross between a pea plant (*Pisum sativum*) with long stem and axial flower with short stem and terminal flowers produce twenty-one seeds. From these seeds, 11 plants grew into plants with long stem and axial flowers while 10 grew into short stem with axial flowers. The genotype of the parents must be  
 (a) TTAA\* ttaa                      (b) TtAA\* ttaa                      (c) TTAA\* ttAa                      (d) TtAA\* ttAA

Ans. [b]

TtAA × ttaa

Sol. long – axial                      shor – terminal flower

Only this parent can produce this 1 : 1 ratio in offspring.

33. From a culture of mammalian cells, a cell in M phase is made to fuse with a second cell in G1 phase. The second cell will go into  
 (a) S phase instantly  
 (b) M phase skipping S phase  
 (c) M phase after quickly completing S phase  
 (d) G2 phase after quickly completing S phase

Ans. [b]

Sol. Certain type of nitotic factor who permotes cell form one M-phase of cells to other cell by skipping s phase.

34. A man with haemophilia has a daughter of normal phenotype. She marries a man who is not haemphilic. If the couple has four sons, what is the possibility that all four will be born haemphilic ?  
 (a) 1/4                      (b) 1/32                      (c) 1/16                      (d) 1/8

Ans. [c]

Sol.

	X <sup>h</sup>	Y
X	X <sup>h</sup> X	XY
X	X <sup>h</sup> X	XY

Haemophic man will produce carrier female offspring

She carrier female marry a normal man

	X	Y
X <sup>h</sup>	X <sup>h</sup> X	X <sup>h</sup> X
X	XX	XY

Probability of haemophilic son will be  $\frac{1}{2}$

So possibility of all four son will be haemophilic will be  $\left(\frac{1}{2}\right)^4 = \frac{1}{16}$ .

35. A wild type fruit fly (heterozygous for grey body colour and normal wings) is mated with a black fly with vestigial wings. The offspring have the following phenotypic distribution : wild type = 998 ' black vestigial = 994 ; grey vestigial = 208; black normal = 200.

What is recombination frequency between the two given alleles ?

- (a) 17 %                      (b) 15 %                      (c) 20 %                      (d) 25 %

Ans. [a]

Sol. BbVv × BbVv

Wild type - 998  
 black vestigial - 994 } Parental (more)

grey vestigial - 208  
 black normal - 200 } Less (Recombinant)

recombinant frequency =  $\frac{408}{2200} \times 100 = 17\%$

36. The percentage composition by volume of gases at various stages of respiration in humans is tabulated below.

	P	Q	R
Oxygen	16.4	20.95	13.8
Caron dioxide	4.0	0.04	5.5
Nitrogen	79.6	79.01	80.7

P, Q and R receptively represent :

- (a) Expired air, alveolar air and inspired air  
 (b) Alavolar air, inspired air and expired air  
 (c) Inspired air, alveolar air and expired air  
 (d) Expired air, inspired air and alveolar air

Ans. [d]

Sol. Correct option d

37. Rejection of transplant is an immune response of the type

- (a) B-lymphocyte mediated humoral  
 (b) Humoral, helper T lymphocytes mediated  
 (c) Cell mediated involving cytotoxic T lymphocytes  
 (d) Cell mediated involving memory T lymphocytes

Ans. [c]

Sol. T-killer or cytotoxic T-lymphocyte (cell mediated Immunity) is responsible for graft rejection.

38. Which of the following insects have 2 pairs of functional wings, shearing mouthparts and incomplete metamorphosis ?

- (a) Butterfly                      (b) Mosquito                      (c) Cockroach                      (d) Dragonfly

Ans. [d]

Sol. Correct option d

39. According to finding from the Human Genome Project, there are about 25000 genes but there are many more different polypeptides. Which of the following processes might explain the discrepancy between number of genes and polypeptides ?

- (1) Mutations  
 (2) Post-translational modifications  
 (3) Crossing over during meiosis  
 (4) Alternating splicing of RNA transcripts
- (a) 1 & 2                      (b) 2 & 4                      (c) 1, 3 & 4                      (d) 3 & 4

Ans. [b]

Sol. (i) Mutation comes change in both gene and polypeptied  
 (ii) Corssing over does not change in gene and polypeptied number  
 (iii) So post translation modifacaiton and alternating RNA splicing causes discrepancy between number of genes and polypeptides

40. In comparison to the mountain goats adapted to climbing rather than running, similar-sized pronghorns that are adapted to run fast, have a 5 times greater rate of oxygen consumption. This is possible due to the following adaptations with an exception of
- Larger surface area in the lungs
  - Greater cardiac output
  - Larger and more abundant erythrocytes
  - Higher volume and density of mitochondria

Ans. [c]

Sol. Pronghorns develop various adaptations due to their high altitude habitat it includes anatomical larger size of respiratory tract hence answer (a) given by IAPT can be considered on above basis. However mammals living on high altitude also show haematological adaptation which include polycythemia and high haemoglobin content in RBC. Therefore option (c) also stands correct.

41. The following is a list of events in synthesis of protein from a DNA template.

- mRNA attaches to the ribosome
- The amino acid is attached to the growing polypeptide by a peptide bond
- mRNA migrates from the nucleus to the cytoplasm
- An aminoacyl tRNA binds to its specific codon on mRNA
- mRNA is transcribed from its DNA template

Identify the correct sequence from the following options.

- (a) v - iii - i - iv - ii      (b) v - ii - i - iii - iv      (c) v - iii - iv - ii - i      (d) v - iii - ii - iv - i

Ans. [a]

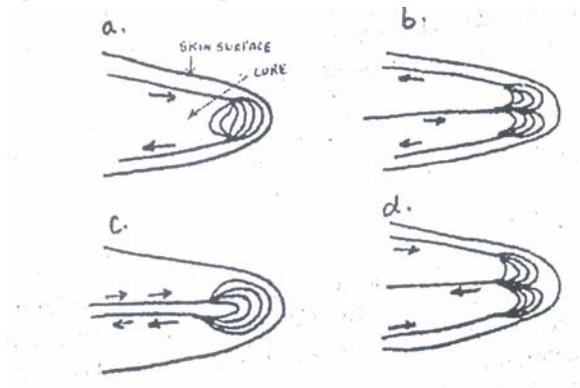
Sol. First mRNA transcribe then transfer then attach to ribosome then t-RNA attach to mRNA then amino acid chain elongate by addition of amino acid.

42. If a plant is made to grow in a solution of biogenic nutrients supplemented with cytokinins it will
- become stunted
  - become etiolated
  - senescence faster
  - become bushy

Ans. [d]

Sol. Cytokinin hormone promotes the lateral branch formation so plant becomes bushy.

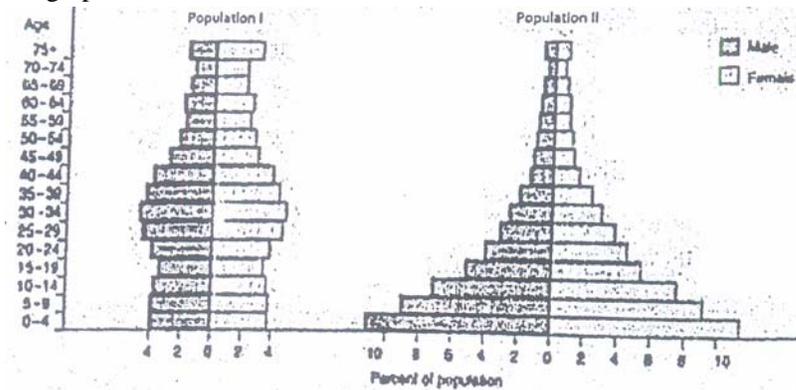
43. Porpoise (*Phocaena* spp.) is a group of small toothed whales found in Polar regions. The mammal is adapted to low temperature conditions. Following four schematic diagrams show possible arrangement of blood vessels in longitudinal section of their flippers. Which one of them is the most appropriate for maintaining optimum body temperature?



Ans. [c]

Sol. Correct option c

44. The two graphs given below explain percent of human population present in each age group for two different countries. The population survey has been carried out in year 1990. Which statement/s correctly describe/s the graphs ?



- (a) Population I is related to poorly developed country while II is from highly developed country  
 (b) Population I shows that more births occurred during 1945 to 1964  
 (c) Population I has substantially higher percent population in age group 30-34 as compared to population II  
 (d) Population II shows that female to male ratio is substantially reduces as the age increases

Ans. [b]

Sol. High population of 30-50 year age group in 1990 shows that high number of birth occurred in 1945 to 1964.

45. To initiate the inflammatory response, histamine that trigger dilation and increased permeability of nearby capillaries, is released by the injured cells in connective tissue called -

- (a) Macrophage (b) Fibroblasts (c) Chondrioblasts (d) Mast cell

Ans. [d]

Sol. Mast cell release histamine

46. Lichens are known to be very sensitive to air pollution because they -

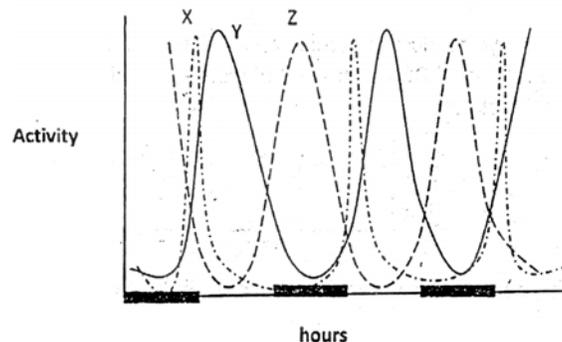
- (a) Fail to photosynthesise in high concentration of  $\text{CO}_2$   
 (b) Do not produce mucilage to buffer against toxic gases  
 (c) Are unable to excrete toxic substance they absorb  
 (d) Cannot reproduce in air polluted with suspended particulate matter

Ans. [c]

Sol.  $\text{SO}_2$  inhibit the photosynthesis in algae, the pollutant is not excreted out.

47. Study of *Gonyaulax polyedra*, a dinoflagellate showed 3 peculiar diurnal cycles X, Y and Z. They respectively most likely represent.

Note that dark line in the graph indicates night



- (a) photosynthesis, respiration and luminescence  
 (b) cell division, photosynthesis and luminescence  
 (c) migration, respiration and luminescence  
 (d) reproduction, respiration and cell division

Ans. [b]

Sol. Photosynthesis is high at day time liminescence is high at right

48. Assume that weight of fruit is being influence by alleles occupying different loci and that the minimu weight of fruit is 20g with 2g being added by each dominant allele. If maximum weight is 36 g, how many gene loci must be involved ?

- (a) 3 (b) 4 (c) 6 (d) 8

Ans. [b]

Sol. aaaaaaaa – 20 g  
 AAAAAAAAAA – 36 g  
 2g being added by each dominant allele  
 So, four gene or gene loci is involved  
 (1 gene loci = 1 pair of allele)

49. Birds like Albatross, spend months at sea drinking sea water. Their osmoregulation strategy includes -

- (i) Excreting salts through nasal glands  
 (ii) Having uric acid as excretory material  
 (iii) Having an active ornithine cycle  
 (iv) Having more juxta-glomerular nephrons in kidneys

- (a) i and ii (b) i and iii (c) iii and iv (d) ii and iv

Ans. [a]

Sol. Albatross Birds : Excreting salts through nasal gland & having urecotelic mode of excretion for osmoregulation

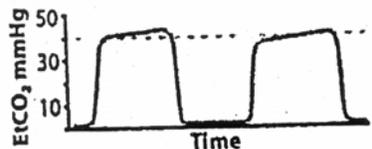
50. An inverted pyramid of biomass is expected for -

- (a) tropical rain forest (b) Grassland (c) open ocean (d) dessert

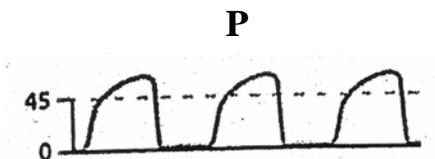
Ans. [c]

Sol.

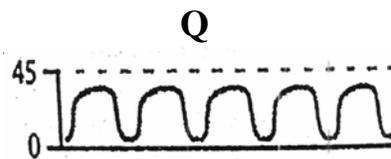
51. Carbon dioxide is a bye product of aerobic respiration. End Tidal CO<sub>2</sub> (Et CO<sub>2</sub>) is maximal concentration of CO<sub>2</sub> at the end exhaled breath. Normal wave of exhalation is shown below -



The following types of waves P and Q respectively indicate



- (a) hypoventilation and bronchospasm  
 (c) bronchospasm and hyperventilation



- (b) hyperventilation and asthma  
 (d) bronchospasm and hypoventilation

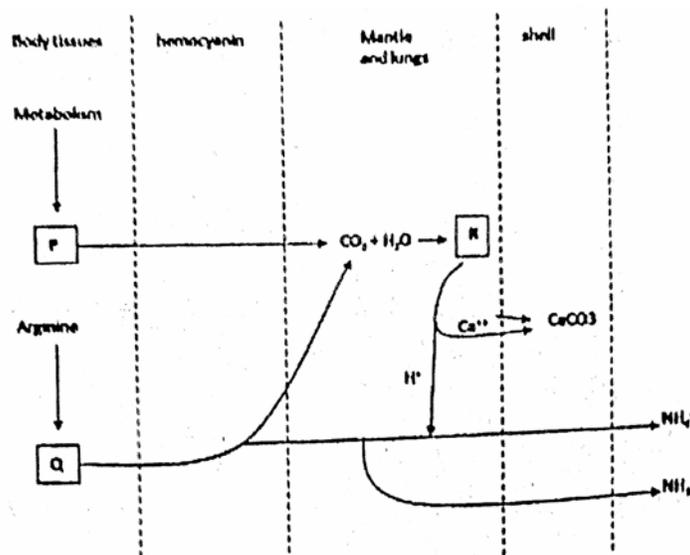
Ans. [c]

Sol. Bronchospasm – spasm of bronchial smooth muscle producing narrowing of the bronchii  
 Hyperventilation condition to breath fast

52. On an average a climax ecosystem has more organic matter in the form of -  
 (a) primary producers (b) consumers  
 (c) decomposers (d) dead organic biomass of all the above

Ans. [d]

53. Mechanism involved in volatilization of ammonia by land snail *Helix* is shown P, Q and R respectively indicate -



- (a) urea, uric acid and bicarbonate (b) carbonic acid, urea and carbonate  
 (c) ATP, arginase and bicarbonate (d)  $\text{CO}_2$ , urea and carbonic acid

Ans. [d]

Sol.  $\text{CO}_2$  produce from metabolism, Argine produce urea and  $\text{CO}_2$  &  $\text{H}_2\text{O}$  react to form carbonic acid.

54. A toad was offered bumble bees as food. The toad got stung by the bees subsequently the toad avoids feeding on insects with black and yellow colouration. This is an example of-  
 (a) Habituation (b) Sensitization (c) Associative learning (d) Innate behaviour

Ans. [c]

Sol. Associative learning is conditional reflex.

55. Endocrine glands play major role in working or ovarian cycle. Following events have to occur in specific sequence in female mammals, especially humans. The correct sequence of given events must be -

P : FSH stimulates granulosa cells to convert androgen to estrogen by aromatase action

Q : LH stimulates theca cells of ovarian follicle to secrete androgen

R : Estrogen promotes growth of endometrium

S : GnRH stimulates secretion of FSH and LH from anterior pituitary cell

- (a)  $\text{P} \rightarrow \text{Q} \rightarrow \text{R} \rightarrow \text{S}$  (b)  $\text{S} \rightarrow \text{Q} \rightarrow \text{P} \rightarrow \text{R}$  (c)  $\text{R} \rightarrow \text{P} \rightarrow \text{Q} \rightarrow \text{S}$  (d)  $\text{S} \rightarrow \text{R} \rightarrow \text{P} \rightarrow \text{Q}$

Ans. [b]

Sol. S : GnRH stimulates secretion of FSH and LH from anterior pituitary cells

Q : LH stimulate theca cells of ovarian follicle to secrete androgens

P : FSH stimulate granulosa cells to convert androgen to estrogen by acromatase action

R : Estrogen promote growth of endometrium

56. In an experiment, extract of brain tissue was subjected to differential centrifugation. It resulted in 5 different zones of separation, 1-5 zone 3 was found to be rich in acetyl cholinesterase activity while zone 5 was rich in succinate dehydrogenase activity. These zone most likely respectively represent -
- (a) Myelin sheath and nuclei (b) Synaptic vesicles and golgi bodies  
(c) Mitochondria and myelin sheath (d) Mitochondria and synaptic vesicles

Ans. [d]

57. During embryo sac development in angiosperms, haploid megaspore continues to divide to form mature female gametophyte. It has 7-celled structure with 8 nuclei, where 6 nuclei are haploid and other two polar nuclei fuse to form diploid structure -

In liliun, one of the two polar nuclei is triploid. Therefore, primary endosperm nucleus formed will be -

- (a)  $3n$  (b)  $4n$  (c)  $5n$  (d)  $2n$

Ans. [c]

Sol. One polar nuclei  $3n$   
another polar nuclei  $n$

So, after triple fusion =  $3n + n + n$   
=  $5n$

58. Anita was studying flower morphology in her school lab. She collected one flower from her school garden and dissected it. She took cross section of ovary and found that ovules were arranged inside the ovary as shown below



She could correlate the seed arrangement in \_\_\_\_\_ fruit with the collected specimen.

- (a) Tomato (b) Green pea (c) Cucumber (d) Bell pepper

Ans. [c]

Sol. Parietal placemation with tri locular ovary in cucumber.

59. In an enzyme catalyzed reaction, it is possible to reverse the inhibition of a reaction by increasing the substrate concentration in which of the following case/cases ?

- (a) Competitive inhibition (b) Non-competitive inhibition  
(c) Uncompetitive inhibition (d) Allosteric inhibition.

Ans. [a]

Sol. Inhibitor similar to substrate bind to activation site in competitive inhibition

60. A proper illumination is necessary to observe details of specimen mounted on a slide while using compound light microscope. It is achieved with the help of mirror. The correct path of light during microscopic observation is-

- (a) Light source → Mirror → Condenser lens → Iris diaphragm → Objective lens → specimaen → Eye piece lens → Eye  
(b) Light source → Mirror → Iris diaphragm → Condenser lens → specimen → Objective lens → Eye piece lens → Eye  
(c) Light source → Condenser lens → Mirror → Iris diaphragm → specimen → Objective lens → Eye piece lens → Eye  
(d) Light source → Mirror → Iris diaphragm → specimen → Condenser lens → Objective lens → Eye piece lens → Eye

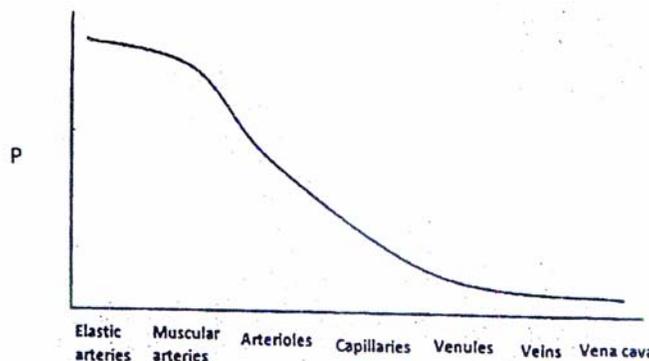
Ans. [b]

61. Rohit's teacher gave him a freshly prepared slide of a vertical section of some unknown plant sample, to observe, Rohit found some non-lignified cells were overlapping with next cells. The cells showed clustered perforations which were distributed uniformly over the cell surface. There were no chloroplast in these cells. This specimen most likely represented \_\_\_\_\_ .
- Stem of Gymnosperm
  - Leaf of monocot
  - Root of dicot
  - Sporophyte of hornwort

Ans. [a]

Sol. In stem of gymnosperm sieve tube cell overlap each other and sieve pores are present on lateral wall

62. Human circulatory system is made up of complex network formed by arteries arterioles, capillaries, venules and veins. The graph given below shows variation in parameter 'P' against different types of blood vessels, 'P' represents -



- Vessel diameter
- Total cross sectional area of vessels
- Average blood pressure
- Velocity of blood flow

Ans. [c]

Sol. Average blood pressure

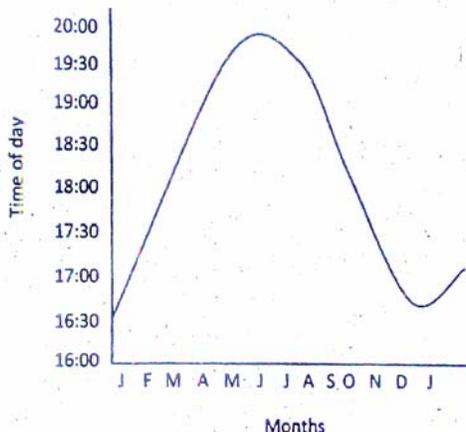
63. During one study on rate of decomposition, litterbag experiment was carried out on three tree species P, Q and R from same forest. In this experiment, 30 litterbags were filled with 5.0 gms of senescent leaf litter for each tree. These bags were made of fine mesh to allow decomposers to access litter but do not let the decomposing material to fall out. These bags were buried in the litter layer of the forest. During a year, five bags of each species were removed at 6 intervals and their contents were dried and weighted. At the end of the experiment, the percent of mass remaining was found to be 75%, 50% and 45% respectively for given three species. The most appropriate reason for this difference is -

- The moisture content of leaves of 'R' species must be higher than others
- The lignin content in 'P' is maximum among all three species
- The difference in type of decomposers involved in process leads to variation in rate of decomposition
- The mass of dead decomposers also added in case of species 'P'

Ans. [b]

Sol. Decomposition of lignin is slower.

64. Southern flying squirrel 'Glaucomys volans' shows variation in their daily activity period throughout the year. As shown in the graph, the time of the day when squirrel becomes active varies considerably.



The reason is -

- The squirrel starts its daily activity with nighfall
- The delayed activity period in April-July corresponds to breeding season
- Higher temperature during day time in spring season leads to late beginning of activities
- The activity starts early at the beginning of the year due to more availability of food

Ans. [a]

Sol. Graph clearly show that daily activity starts after evening.

65. Following statements are made about Non-coding DNA, Mark the statement that is **INCORRECT**.

- Non-coding DNA can be transcribed into functional non-coding RNA molecules
- Non-coding DNA can contribute towards evolution of Genome
- Non-coding DNA may predispose individual to cancer
- Non-coding DNA can be the causative agent of Tuberculosis

Ans. [d]

Sol. Tuberculosin is Bacterial infections disease. It is non genetic disease.

66. While cloning a Eukaryotic gene in Prokaryotic expression vector-

- gene of interest is inserted in a cloning vector with active prokaryotic promoter
- mRNA of gene of interest is inserted in a cloning vector with active prokaryotic promoter
- cDNA of gene of interest is inserted in a cloning vector with active prokaryotic promoter
- gene of interest is inserted in a cloning vector with active prokaryotic enhancer sequence

Ans. [c]

Sol. cDNA is most common form of gene which add with vector.

67. The number and types of vertebrae in a few mammals are tabulated below :

Type of vertebrae	Number of vertebrae		
	Animal I	Animal II	Animal III
Cervical	1	7	7
Thoracic	7 (abdominal)	12	13
Lumbar		5	6
Sacral	1	5	4
Caudal	0	4	30



Ans. [b]

Sol. oxyhemoglobin dissociation curve shift to left on high pH and low temperature.

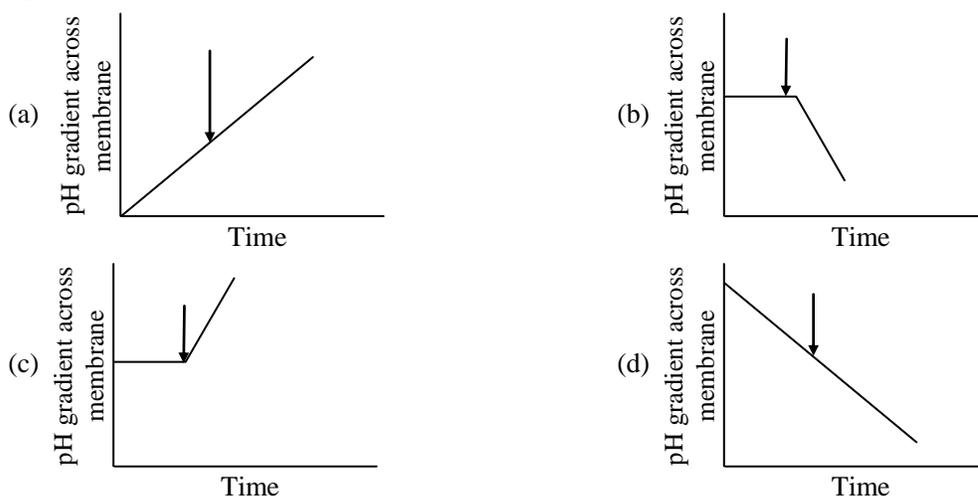
71. Which of the following is the property of a Stem cell ?

- (a) They can differentiate into all possible types of cells and are found only in embryonic tissue
- (b) They can differentiate into other types of cells and they are capable of dividing and renewing themselves for long periods
- (c) Stem cells are unspecialized and they cannot be grown in laboratory conditions
- (d) All the above

Ans. [b]

Sol. Stem cells are biological cells that can differentiate into other types of cells and can divide to produce more of the same type of stem cells.

72. In an experiment to study the effect of a certain compound 'X', actively respiring plant cells were treated with 'X' after some time of the start of the experiment. The pH gradient across the mitochondrial membrane was monitored throughout the experiment. Compound X was known to specifically target mitochondrial ATP synthases and lead to complete inhibition of the enzyme. Which of the following graphs would be the expected outcome of this experiment? The arrow in the graph indicates the time of addition of compound 'X'.



Ans. [c]

Sol. If  $F_0 - F_1$  particle or ATP synthase are blocked  $H^+$  does not diffuse back so  $H^+$  conc. increases in perimitochondrial space

73. Colorimetry has widest applications in biological sciences. While measuring the growth (rate) of a bacterial culture, which phenomenon is taken into consideration ?

- i. Absorption of light by the bacterial media
- ii. Absorption of a specific wavelength of light by the bacterial cells
- iii. Scattering of light by the bacterial cells

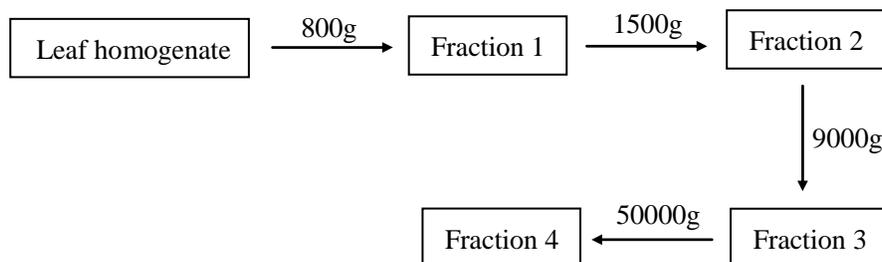
Mark the correct option.

- (a) i and ii
- (b) ii and iii
- (c) i only
- (d) iii only

Ans. [d]

Sol. Colorimetry is based on Beer's lamber's law according to which the absorption of light transmitted through medium is directly proportional to the medium concentration. More the growth more will be scattering properly.

74. Ananya wanted to isolate and study organelles involved in packaging and transporting of proteins to various locations in a cell. Her colleague had carried out the following experiment ; she ground a piece of spinach leaves and carried out differential centrifugation. A scheme of the protocol she followed along with the centrifugation speed (in g) at every step is given below :



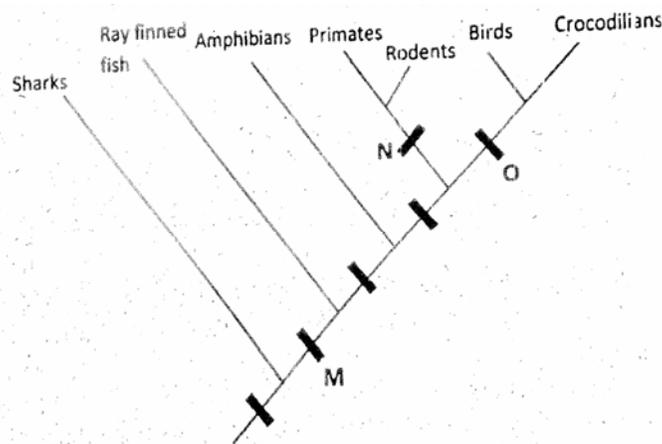
The fraction that would give Ananya the purified fraction of the organelle of her interest would be

- (a) 1                                      (b) 2                                      (c) 3                                      (d) 4

**Ans.** [d]

**Sol.** Fraction 4 contain membranous structure including E.R.

75. Classification of a few animals is shown in the cladogram. The characters M, N and O respectively represent



- (a) Vertebrae, sweat glands, amniotic egg                                      (b) Bony skeleton, hair, eggs with shell  
 (c) Vertebrae, amniotic egg, feathers    (d) Notochord, four legs, amniotic eggs

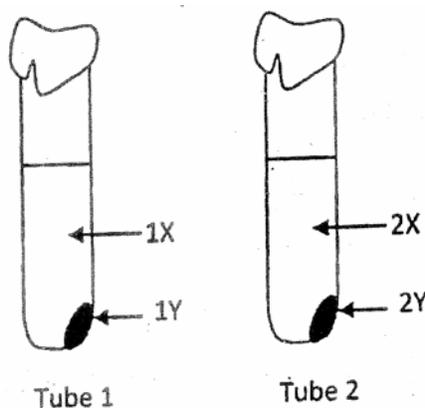
**Ans.** [b]

**Sol.** Cladogram is a diagram used in cladistics to show relation among organisms.

76. In an experiment to test the component of a bacteriophage that might be the hereditary material that enters a bacterial cell to direct the assembly of new viruses, the following two experiments were performed :

**Experiment 1 :** Virus were labeled with radioactive phosphorus ( $^{32}\text{P}$ )  $\rightarrow$  labeled virus were allowed to infect unlabeled bacteria  $\rightarrow$  mixture was agitated to detach viruses from bacterial cells  $\rightarrow$  centrifugation was carried out to form bacterial pellet while viruses remained in the supernatant as indicated in tube 1.

**Experiment 2 :** Virus were labeled with radioactive sulfur ( $^{35}\text{S}$ )  $\rightarrow$  labeled virus were allowed to infect unlabeled bacterial  $\rightarrow$  mixture was agitated to detach viruses from bacterial cells  $\rightarrow$  centrifugation was carried out to form bacterial pellet while viruses remained in the supernatant as indicated by tube 2.



radioactive  $^{32}\text{P}$  and  $^{35}\text{S}$  are expected to be found maximally in which of the following parts of the tubes ?  
 (a) 1X and 2X (b) 1Y and 2X (c) 1Y and 2Y (d) 1X and 2Y

**Ans.** [b]

**Sol.** Radioactive  $^{32}\text{P}$  attach with DNA of bacteriophage, it will enter in bacteria, Bacteria is present in sediment part 1y is tube I.

$^{35}\text{S}$  will attach to protein coat in bacteriophage and bacteriophage will be present in supernatant part in tube 2

77. Pure water seems to be colorless in visible region of the electromagnetic spectrum. This is because-
- (a) When a beam of visible light falls on it, the energy spectrum does not cause any change in the molecule.  
 (b) No energy is absorbed.  
 (c) Water molecules lack chromophore.  
 (d) All of the above.

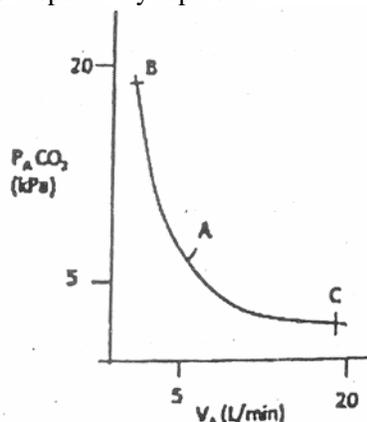
**Ans.** [d]

78. A living, colorless, unstained organism can be best viewed using :
- (a) Brightfield light microscope  
 (b) Darkfield light microscope.  
 (c) Fluorescent microscope  
 (d) Scanning electron microscope.

**Ans.** [b]

**Sol.** Dark field light, microscope use to study living colorless, unstained organism.

79. The graph depicts the relationship between alveolar ventilation and partial pressure of carbon dioxide in alveolar air. Regions AB and AC respectively represent :



- (a) acidosis and alkalosis.  
 (b) acidosis and hypoventilation.  
 (c) alkalosis and hyperventilation.  
 (d) alkalosis and hypoventilation.

**Ans.** [a]

**Sol.** The answer given by IAPT is based on the persaption that as the alveolar ventilation increases on the x-axis the partial pressure for CO<sub>2</sub> in blood falls and the condition of blood changes from acidosis to alkalosis hence IAPT has given option (a) as the answer.

Howeven this graph can also be interpreted in the following maner : as the alveolar vantitation increases on the x-axis the partical presure for CO<sub>2</sub> falls on y-axis from pint B to point A and starts to create a condition of alkalosis further we also know that highper vantilation will increase the alveolar ventilation hence the point c in the segment A-C can also denote highper ventilation.

**80.** Some bacterial form a slimy, viscous layer covering the cell wall. This layer is known as capsule. These capsules are beneficial to the bacteria because :

(i) they attract other bacterial to form colonies.

(ii) they enable bacteria to stick to the surface

(iii) capsules contain water which protects the bacteria against dessication.

(a) i and ii only

(b) ii and iii only

(c) iii only

(d) i, ii and iii

**Ans.** [d]

**Sol.** Slime viscous layer of bactenal cell wall protect bacteria from decication, phagocytosis and also attract other bacteria to form colonies.