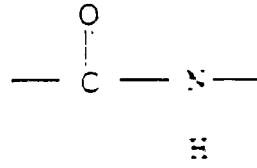


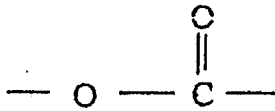
1 Which of the following contains an ester bond?



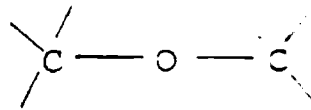
A



B



C



D

2 Which process enables cholesterol to enter into the liver cells?

- A Facilitated diffusion
- B Phagocytosis
- C Pinocytosis
- D Receptor-mediated endocytosis

3 The table below shows organelles (a) to (d) and functions (i) to (iv).

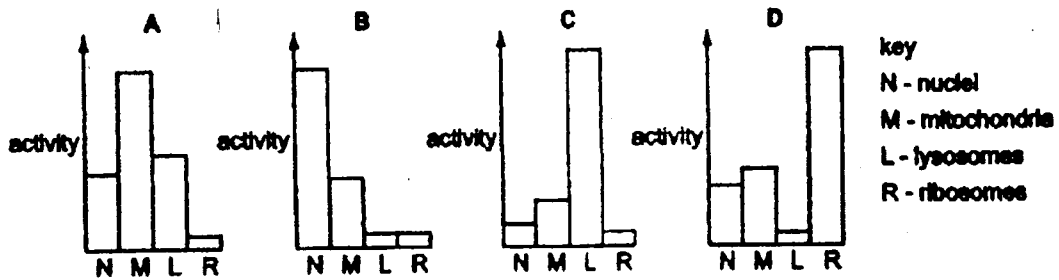
<i>Organelle</i>	<i>Function</i>
(a) Mitochondrion	(i) Lipid and steroid synthesis
(b) Golgi apparatus	(ii) Oxidative phosphorylation
(c) Centriole	(iii) Formation of lysosome
(d) Smooth endoplasmic reticulum	(iv) Production of spindle fibres

Which of the following correctly matches the organelles with their functions?

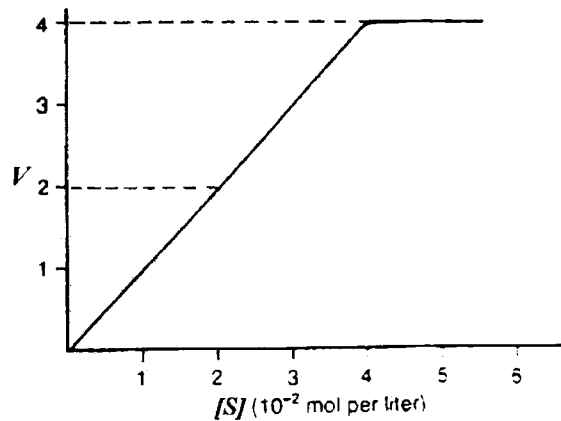
- A (a)(ii), (b)(i), (c)(iv), (d)(iii)
- B (a)(iii), (b)(ii), (c)(iv), (d)(i)
- C (a)(i), (b)(iii), (c)(iv), (d)(ii)
- D (a)(ii), (b)(iii), (c)(iv), (d)(i)

- 4 A piece of mammalian tissue was homogenised and subjected to differential centrifugation to yield four sub-cellular fractions.

Which bar chart shows the fraction with the most hydrolytic enzyme activity?



- 5 The graph below shows the velocity of reaction V of an enzyme, against the substrate concentration, $[S]$. From the graph, the value of Michaelis-Menten constant, K_m is

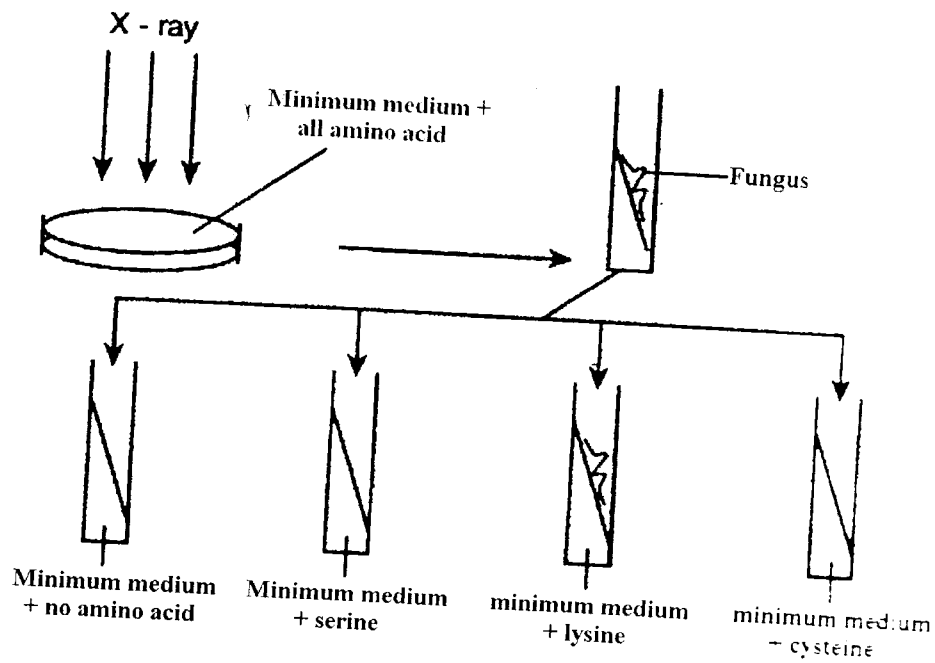


- A 1×10^{-2} mol per litre
 B 2×10^{-2} mol per litre
 C 3×10^{-2} mol per litre
 D 4×10^{-2} mol per litre

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- 6 In a study, *Neurospora* spores irradiated with X-ray are cultured in a medium with all the amino acids. The fungi that grow are sub-cultured in 4 tubes containing medium as shown in the diagram below.



The fungus only grows in the minimum medium with lysine. This indicates that

- A X-ray has destroyed the enzyme for the synthesis of lysine.
- B mutant fungus lacks enzyme for the synthesis of lysine.
- C normal fungus does not synthesise lysine.
- D one gene controls the synthesis of one amino acid.

- 7 The following table shows the codons of mRNA molecules that code for the various amino acids in the synthesis of proteins.

First base	Second base				Third base
	U	C	A	G	
U	Phe	Ser	Tyr	Cys	U
	Phe	Ser	Tyr	Cys	C
	Leu	Ser	c.t.	c.t.	A
	Leu	Ser	c.t.	try	G
C	Leu	Pro	His	Arg	U
	Leu	Pro	His	Arg	C
	Leu	Pro	Gln	Arg	A
	Leu	Pro	Gln	Arg	G
A	Ileu	Thr	Asn	Ser	U
	Ileu	Thr	Asn	Ser	C
	Ileu	Thr	Lys	Arg	A
	Met	Thr	Lys	Arg	G
G	Val	Ala	Asp	Gly	U
	Val	Ala	Asp	Gly	C
	Val	Ala	Glu	Gly	A
	Val	Ala	Glu	Gly	G

c.t – Chain termination code

Which is the probable base sequence of the gene that codes for the synthesis of the following polypeptide?

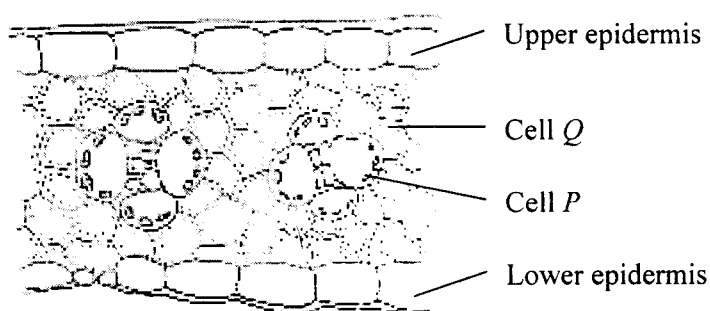
Arg – Tyr – Leu – Pro – Ser

- A CGU UAU CUU CCU UCU
 B CGT TAT GTT GGA TCT
 C CGG TAT GTT GGA TCT
 D GCA ATG GAA GGA AGA

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- 8 The diagram below shows two types of photosynthetic cells, *P* and *Q*, in the leaves of a C_4 plant.



Which of the following reactions occur in cells *P* and *Q* respectively?

<i>Cell P</i>	<i>Cell Q</i>
A Malate \rightarrow Pyruvate + Carbon dioxide	Oxaloacetate \rightarrow Malate
B Pyruvate \rightarrow Malate	Malate \rightarrow Pyruvate
C Pyruvate \rightarrow Oxaloacetate	PGA \rightarrow PGAL
D Malate \rightarrow Pyruvate	RuBP \rightarrow PGA

- 9 Which of the following are true of Photosystems I and II in plants?
- i* The light absorption peak of Photosystem I is at the wavelength of 680 nm.
 - ii* In the light reaction, the electrons that are released from Photosystem II are accepted by Photosystem I.
 - iii* Some of the electrons released from Photosystem I are accepted by $NADP^+$
 - iv* Both Photosystems I and II are found in the thylakoid membrane.
- A *i* and *iv*
 B *ii* and *iv*
 C *i*, *ii* and *iii*
 D *ii*, *iii* and *iv*

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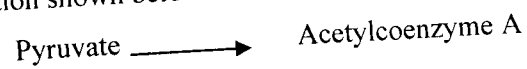
10 During respiration, the electrons are passed along a chain of electron carriers. Listed below are four of the carriers found in the electron transport system.

- I Coenzyme Q
- II NAD^+
- III Flavoprotein
- IV Cytochrome

Which of the following is the correct sequence for the transport of electrons along these four carriers?

- A I, II, III, IV
- B II, III, I, IV
- C II, III, IV, I
- D III, II, III, IV

11 The reaction shown below occurs in all aerobic cells.



Which of the following statements are true of the above reaction?

- I The reaction happens in the cytoplasm of the cells.
- II The above reaction involves oxidative decarboxylation.
- III 2H are released and received by NAD^+ .
- IV ATP energy is used in the above reaction.
- V Carbon dioxide is released during this reaction.

- A I and III
- B II and V
- C I, II and IV
- D II, III and V

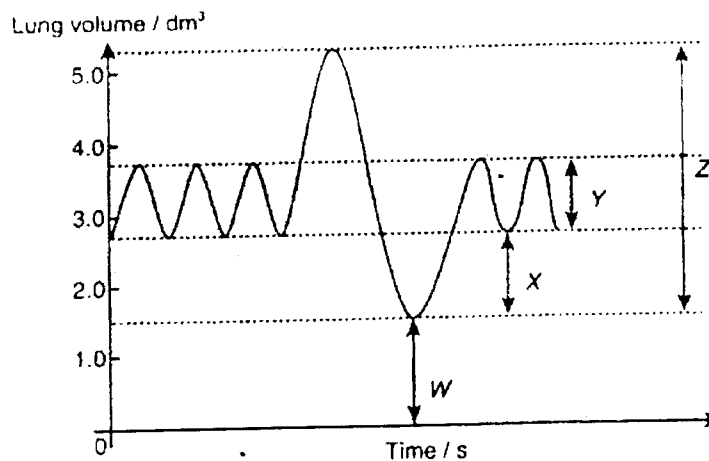
- 12 The table below shows four types of relationships and the effects of their interactions. Which of the following is **not** a correct match?

	<i>Relationship</i>	<i>Effects of interaction</i>
A	Commensalism	(+) : (0)
B	Competition	(-) : (0)
C	Mutualism	(+) : (+)
D	Parasitism	(+) : (-)

Key :

- (+) – Beneficial effect
- (o) – No effect
- (-) – Harmful effect

- 13 Which of the following combinations is true for the lung volumes as represented by W, X, Y and Z in the breathing changes shown in the graph?



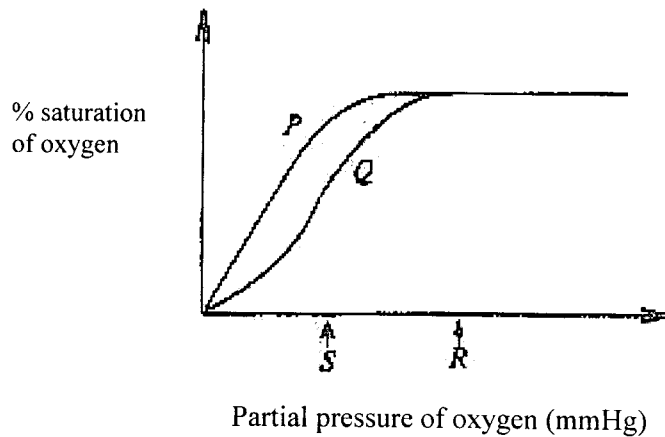
- I Residual volume
- II Vital capacity
- III Tidal volume
- IV Expiratory reserve volume

	<i>W</i>	<i>X</i>	<i>Y</i>	<i>Z</i>
A	I	IV	II	III
B	I	IV	III	II
C	IV	I	II	III
D	IV	II	I	III

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- 14 The graph below shows the oxygen dissociation curves for haemoglobin solution (*P*) and mammalian blood (*Q*). *R* and *S* represent the partial pressures of oxygen in the lungs and tissues respectively



The oxygen dissociation curve *Q* shows that physiologically the mammalian blood is more efficient than the haemoglobin solution because

- A mammalian blood has a higher affinity for oxygen than the haemoglobin solution.
 - B the haemoglobin solution stores more oxygen at *S* than the mammalian blood.
 - C the haemoglobin solution has a higher affinity for oxygen than mammalian blood.
 - D mammalian blood releases more oxygen at *S* than the haemoglobin solution.
- 15 Which of the following is **not** involved in stomatal opening?
- A Activation of proton-pump.
 - B Potassium ions moving into guard cells.
 - C Water entering by osmosis into the guard cells.
 - D Accumulation of abscisic acid (ABA) in the guard cells.
- 16 Surgery on the septum in the lower region of the human heart may cause damage to the nerve fibres within the septum. Which phase of the cardiac cycle would be directly affected by such damage?
- A Atrial systole
 - B Atrio-ventricular node (AVN) stimulation
 - C Diastole
 - D Ventricular systole

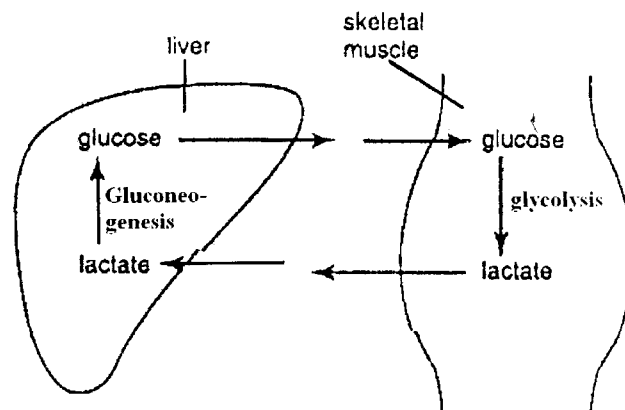
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17 Which hypothesis of translocation in phloem assumes that energy required for translocation is obtained from a potential difference across a sieve plate?

- A Cytoplasmic streaming hypothesis
- B Cohesion-tension hypothesis
- C Electro-osmosis hypothesis
- D Peristaltic wave hypothesis

18 What is the biochemical pathway shown in the diagram?



- A Calvin cycle
- B Cori cycle
- C Krebs cycle
- D Hatch-Slack pathway

19 When blood is acidic, which of the corrective mechanisms are carried out in the distal convoluted tubule?

- I Tubule cells secrete H^+ ions into the lumen of the tubule.
- II HCO_3^- and Na^+ are transported into the blood in the capillaries.
- III NH_3 diffuses into the blood to form ammonium salts
- IV Dihydrogen phosphate ions dissociate to form hydrogen phosphate ions and hydrogen ions.

- A I and II
- B I and III
- C II and III
- D II and IV

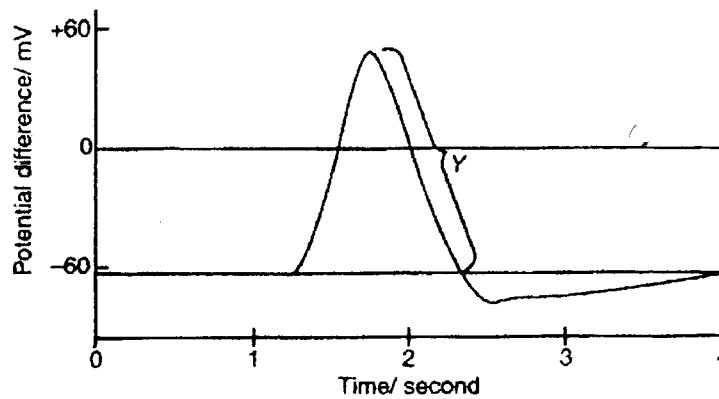
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20 Impulse travels very rapidly along nerves to the leg muscle of a mammal. Which of the following accounts for the speed at which the impulse travels?

- A A nerve impulse is an all-or-nothing phenomenon.
- B The nerves contain myelinated fibres.
- C There is a high concentration of Na^+ inside the axons.
- D There is a potential difference across the axon membranes.

21 The graph below shows an action potential produced by an electrical impulse on a neurone. What occurs at Y?

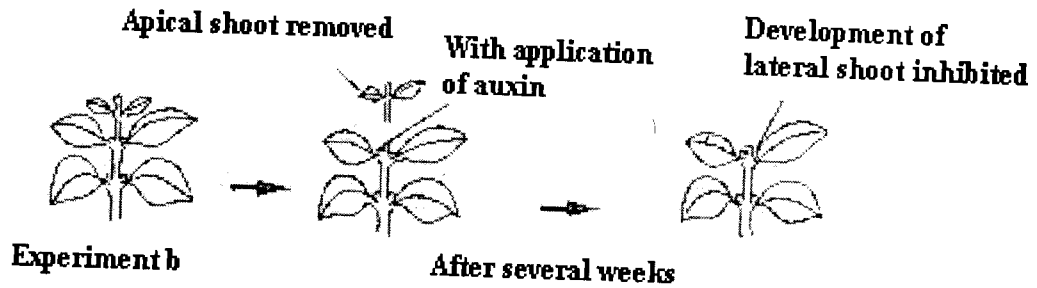
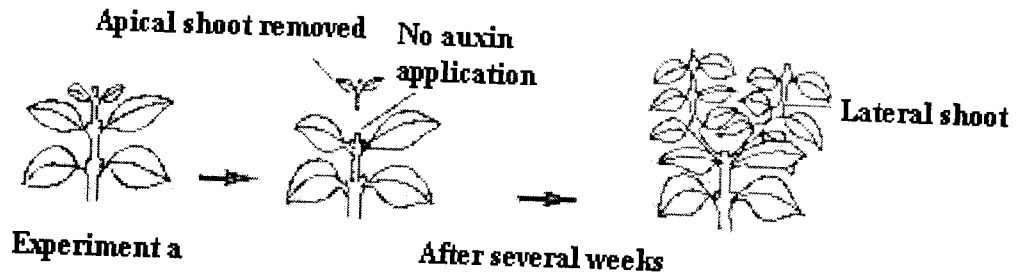


- A Potassium ions enter the axon of the neurone.
- B Sodium ions enter the axon of the neurone.
- C Potassium ions leave the axon of the neurone.
- D Sodium ions leave the axon of the neurone.

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22 The diagrams below show experiments conducted to investigate the effect of auxin.



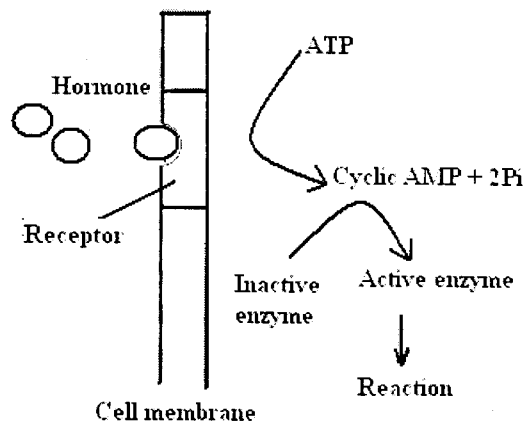
Which of the following can be concluded from the above experiments?

- I Auxin is produced in the shoot apex.
 - II Auxin inhibits lateral shoot growth.
 - III Auxin promotes positive phototropism in shoots.
 - IV Auxin is transported from the shoot apex to the root.
- A I and II
 - B I and IV
 - C II and III
 - D II and IV

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23 The diagram below shows the mechanism of action of a type of hormone.



Which of the following are true of this hormone?

- I It is a steroid hormone.
 - II The cyclic AMP activates adenyl cyclase.
 - III Cyclic AMP acts as the second messenger.
 - IV Insulin is an example of this type of hormone.
- A I and II
 - B III and IV
 - C II, III and IV
 - D I, II, III and IV
- 24 If a long-day plant has a critical night length of 10 hours, which of the following 24-hour cycles would prevent flowering?
- A 15 hours light followed by 9 hours darkness
 - B 14 hours light followed by 10 hours darkness
 - C 12 hours light followed by 12 hours darkness
 - D 4 hours light followed by 8 hours darkness, 4 hours light and 8 hours darkness

25 Which of the following is the correct sequence of events of HIV infection?

- I Reverse transcription of viral RNA to DNA.
- II HIV virus attaches itself to the T₄ cell membrane.
- III Viral DNA combines with the T₄ cell DNA.
- IV Replication of virus occurs in T₄ cell
- V Viral RNA and the enzyme reverse transcriptase are released into T₄ cell.

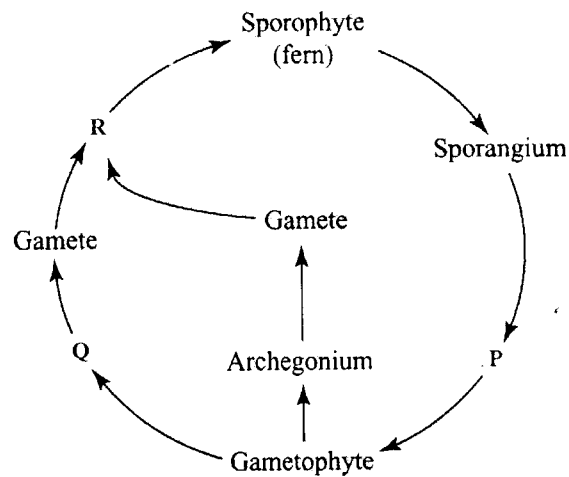
- A I, III, IV, V, II
- B II, V, I, III, IV
- C II, V, I, III, IV
- D II, V, I, III, IV

26 Which of the following are involved in the humoral immune response?

- I Plasma cells
- II Cytotoxic T cells
- III Memory B cells
- IV Helper T cells

- A I and II
- B III and IV
- C I, II and III
- D I, III and IV

27 The diagram below shows the life cycle of a fern.



What are P, Q and R?

	P	Q	R
A	Spore	Zygote	Antheridium
B	Spore	Antheridium	Zygote
C	Zygote	Antheridium	Spore
D	Antheridium	Zygote	Spore

28 The table below shows three types of plant and the characteristics of their generations.

Plant	Generation characteristics
I <i>Marchantia</i> sp. α	(a) Sporophyte is dependent on gametophyte.
II <i>Dryopteris</i> sp.	(b) Gametophyte is dependent on sporophyte.
III <i>Pinus</i> sp.	(c) Sporophyte is not dependent on gametophyte.

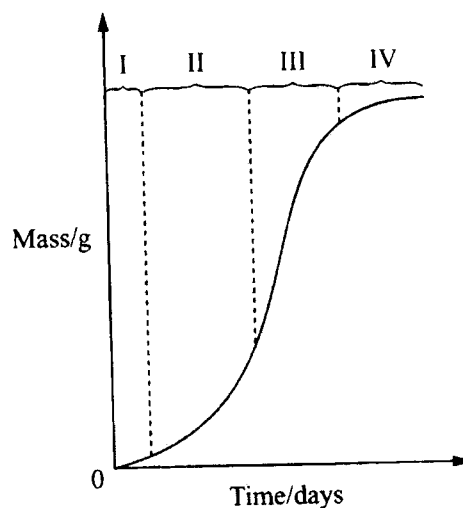
Which of the following is the correct match?

	I	II	III
A	(c)	(a)	(b)
B	(a)	(c)	(b)
C	(b)	(c)	(a)
D	(b)	(a)	(c)

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- 29 Which of the following statements correctly describes the mobilisation of nutrients during seed germination?
- A The embryo produces gibberellic acid which causes the aleurone layer to synthesise amylase and other hydrolytic enzymes.
 - B The aleurone layer produces gibberellic acid which stimulates the synthesis of amylase.
 - C The aleurone layer produces amylase which stimulates the embryo to synthesise gibberellic acid.
 - D Gibberellic acid prevents the synthesis of amylase and other hydrolytic enzymes.
- 30 The diagram below shows the growth curve of an organism. I, II, III, and IV represent the growth phases of the organism.



Which phase has the lowest growth rate?

- A I
 - B II
 - C III
 - D IV
- 31 Which is **not** true of dormancy in animals?
- A In pseudohibernation, the animals are in a state of torpor.
 - B Diapause is often not triggered by a deficiency of growth stimulating hormone.
 - C Diapause can be divided into obligatory diapause and facultative diapause.
 - D The garden snail *Helix* aestivates during the hot dry season by hiding inside its protective shell.

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- 32 A woman who is normal has a haemophiliac father. She marries a haemophiliac man. What is the probability that a girl born to this couple will be haemophiliac?
- A 0.75
B 0.66
C 0.50
D 0.25
- 33 The diagram below shows the structure of a pair of homologous chromosomes which has undergone mutation.



What type of mutation is shown above?

- A Inversion
B Translocation
C Deletion
D Duplication
- 34 Which of the following could cause polyploidy?
- A Faulty DNA replication before cell division.
B Duplication of RNA during transcription.
C Failure of daughter nuclei to separate at the end of mitosis.
D Failure of homologous chromosomes to separate during meiosis.

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- 38 In the lactose operon, both genes *L* and *M* undergo the transcription process. Gene *M* can only undergo transcription in the presence of lactose. For this to occur, gene *N* must be switched on by the inactivation of the product of gene *L*.

Which of the following is true about the genes *L*, *M* and *N*?

	<i>L</i>	<i>M</i>	<i>N</i>
A	Structural gene	Promoter gene	Operator gene
B	Operator gene	Regulator gene	Structural gene
C	Structural gene	Operator gene	Regulator gene
D	Regulator gene	Structural gene	Operator gene

- 39 Which of the following is true about *Escherichia coli* which has a mutated and non-functional regulator gene?

- A β -galactosidase enzyme is synthesised in the presence of lactose.
 B RNA polymerase is unable to bind with promoter gene.
 C *Escherichia coli* produces β -galactosidase, lactose permease and transacetylase continuously.
 D Only β -galactosidase and lactose permease is produced.

- 40 The process of transferring target DNA into vector DNA using restriction enzymes and DNA ligase is called

- A isolation
 B insertion
 C cloning
 D transformation

- 41 Which of the following is the correct form of the scientific name for "Flame-of-the-forest" in Linnaeus Binomial system?

- A *Delonix regia*
 B *Delonix Regia*
 C Delonix Regia
 D Delonix regia

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42 Which of the following statement(s) is/are true about taxa in taxonomy?

- I Division is equivalent to phylum.
- II Order names for plants usually end with 'ales'.
- III Family is a group of apparently related orders.
- IV Organisms of the same family belong to the same order.

- A II
- B III and IV
- C I, II and IV
- D I, II, III and IV

43 The table below shows four plant phyla and their examples.

<i>Phylum</i>	<i>Example</i>
I Fungi	(a) <i>Caesalpinia</i>
II Filicinophyta	(b) <i>Mucor</i>
III Coniferophyta	(c) <i>Dryopteris</i>
IV Angiospermophyta	(d) <i>Pinus</i>

Which of the following is the correct match for the above four phyla and their examples?

- | | | | | |
|---|-----|-----|-----|-----|
| | I | II | III | IV |
| A | (a) | (b) | (c) | (d) |
| B | (b) | (c) | (d) | (a) |
| C | (c) | (d) | (a) | (b) |
| D | (d) | (c) | (a) | (b) |

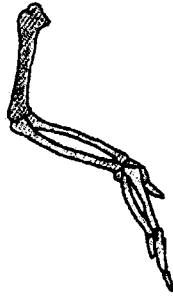
44 A variation that is determined by different alleles of a single gene and has no intermediate form can be found in

- A skin colour
- B body mass
- C iris colour
- D height

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45 Which of the following pentadactyl limbs below does **not** belong to the same class of animals?



A



B



C



D

46 The success of organisms in an ecosystem can be shown by

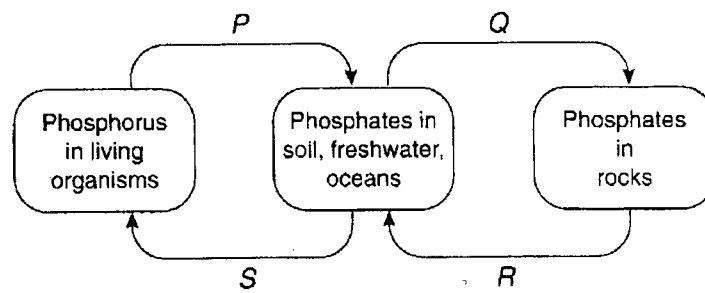
- I Prey-predator relationship
- II Competition
- III Population size
- IV Population distribution

- A I and II
- B I and III
- C II and IV
- D III and IV

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47 The diagram below shows the summary of the phosphorus cycle.



Which of the following shows decomposition?

- A P
- B Q
- C R
- D S

48 The term 'niche' refers to

- A the natural place where an organism normally lives.
- B the physical space occupied by an organism and its functional role in an ecosystem.
- C the different populations living together in a particular habitat.
- D a particular place where an individual species is normally found.

49 Which of the statements are true about r and K strategies?

- I r -selected organisms have adaptations to environments with abundant resources.
- II K -selected organisms are adapted to environments which are close to their carrying capacity.
- III r -strategists have traits that contribute to low intrinsic rate of growth.

- A I and II
- B I and III
- C II and III
- D I, II and III

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- 50 A 25 cm x 25 cm quadrat is used to study the density of *Imperata* sp. in a school field. The results obtained are shown in the table below.

Quadrat	1	2	3	4	5	6	7	8	9	10
Quantity	20	4	16	20	0	18	4	10	8	0

Using the data given above, calculate the density of *Imperata* sp. per m².

- A 10
- B 100
- C 160
- D 320