SULIT
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1 ¾ hour

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# BIOLOGY
# PAPER 1

Instructions to candidates:

**DO NOT OPEN THIS BOOKLET UNTIL YOU ARE TOLD TO DO SO.**

There are **fifty** questions in this paper. For each question four suggested answers are given. Choose **one** correct answer and indicate it on the multiple-choice answer sheet provided. Read the instructions on the multiple-choice answer sheet very carefully.

Answer **all** questions. Marks will not be deducted for wrong answers.

This question paper consists of **18** printed pages.

1 Below are four statements about lipids

I lipids consists of glycerol combined with alcohol
II both fats and oils are triglycerides
III oils are more saturated with hydrogen than fats
IV lipids are more highly reduced substances than carbohydrates

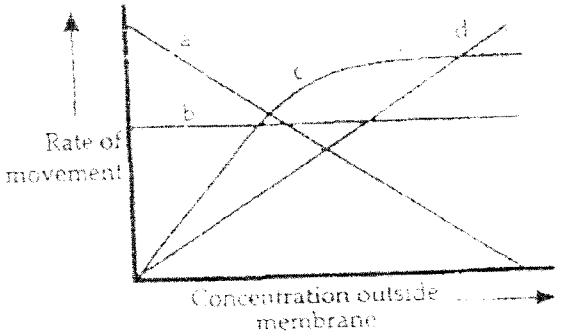
Which one of the following combinations of statements is correct ?

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

2 Which type of molecular association is responsible for the helix configuration of polypeptide chains ?

A Linkages between amino groups and carboxyl groups with the removal of water
B Bridges formed by hydrogen bonds established within the molecule between the NH group of one amino acid residue and the CO group of another
C Linkages established by hydrogen bonds between R side chains of amino acid residues
D Intramolecular ionic bonds between R side chains of amino acids

3 Which of the following curves shows best the relationship between its concentration outside the membrane and its rate of movement through the membrane for a substance passing through the membrane by simple diffusion and facilitated diffusion respectively?



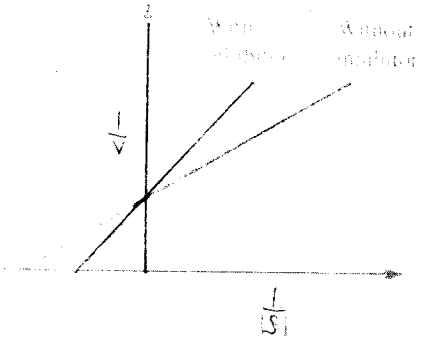

| | Simple diffusion | Facilitated diffusion |
|---|---|---|
| A | d | b |
| B | d | c |
| C | c | a |
| D | c | d |

4 The table below shows some organelles and their functions

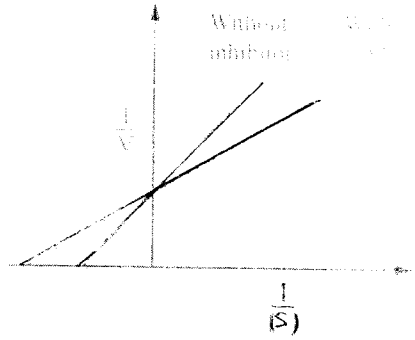
| Organelle | Function |
|---|---|
| (a) rough endoplasmic reticulum | I produce ATP |
| (b) mitochondrion | II break up polymer to monomer in the cells |
| (c) lysosome | III transport substance out of the cell |
| (d) Golgi body | IV produce proteins for use outside the cell |

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

5 Which of the following graphs shows the possible changes in the rate of a reaction catalysed by an enzyme in the presence of a non-competitive inhibitor ?




A

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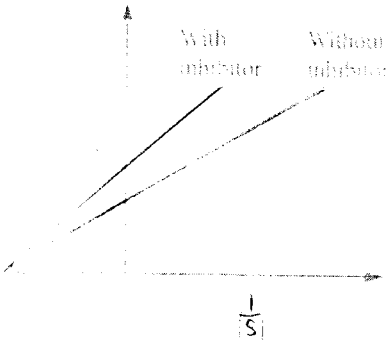


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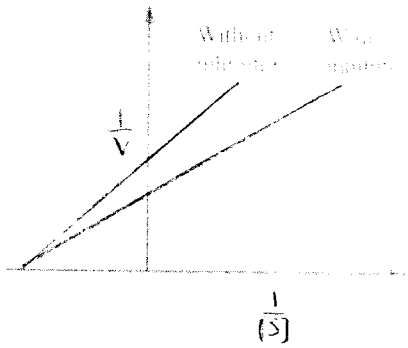



D

6 Which of the following tissues are able to photosynthesize, provide support and their cell walls are permeable to water ?

I parenchyma
II collenchyma
III schlerenchyma
IV xylem

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

7 The statements below explain the roles of ribosomes in protein synthesis.

I Ribosome moves to the next part of the mRNA strand
II tRNA together with the amino acid move into position when the ribosome moves across a particular base triplet
III The ribosome attaches to one end of the mRNA and moves progressively to the other end
IV Another amino acid molecule is brought into position by tRNA molecule
V As ribosme moves along the mRNA more amino acids are added to the polypeptide chain

Which one of the following shows the correct sequence for protein synthesis?

A II→I→III→IV →V
B II→III→IV→I→V
C III→IV→II→ V→I
D III→II→I→IV→V

8 Which of the following shows the correct match?

(i) uses RuBP ; produces PGA
(ii) uses ATP and NADPH
(iii) forms NADPH
(iv) produces ATP and NADPH
(v) produces only ATP

(a) Cyclic photophosrylation
(b) Non-cyclic photophosphorylation
(c) Carbon dioxide fixation
(d) Formation of PGAL
(e) Transfers $H^+$ and electrons to $NADP^+$

| | (i) | (ii) | (iii) | (iv) | (v) |
|---|---|---|---|---|---|
| A | (c) | (d) | (a) | (e) | (b) |
| B | (b) | (a) | (c) | (d) | (c) |
| C | (d) | (c) | (a) | (b) | (e) |
| D | (c) | (d) | (e) | (b) | (a) |

9 Which of the following describes the dark stage of photosynthesis in $C_3$ and $C_4$ plants correctly ?

| | $C_3$ Plants | $C_4$ Plants |
|---|---|---|
| A | This stage occurs in the dark only | This stage occurs in the dark only |
| B | $CO_2$ is fixed by phosphoenolpyruvate | $CO_2$ is fixed by ribulose bisphosphate |
| C | The first intermediate formed from $CO_2$ fixation is phosphoglyceric acid | The first intermediate formed from $CO_2$ fixation is oxaloacetic acid. |
| D | Phosphoglyceraldehyde is produced as a result of reduction | Phosphoglyceraldehyde is not produced as a result of reduction |

10 Six tubes were set up as shown in the table

| Tube | Contents | |
|---|---|---|
| 1 | Glucose | + homogenized animal cells |
| 2 | Glucose | + mitochondria |
| 3 | Glucose | + cytoplasm lacking organelles |
| 4 | Pyruvate | + homogenized animal cells |
| 5 | Pyruvate | + mitochondria |
| 6 | Pyruvate | + cytoplasm lacking organelles |

After incubation each sample was analysed to determine the presence of carbon dioxide and lactate.
In which tubes is lactate most likely to be present?

A 1 and 3
B 3 and 6
C 4, 5 and 6
D 2, 3, 5 and 6

11 Which of the following substances are produced when one molecule of acetyl coenzyme A enters the Krebs cycle?

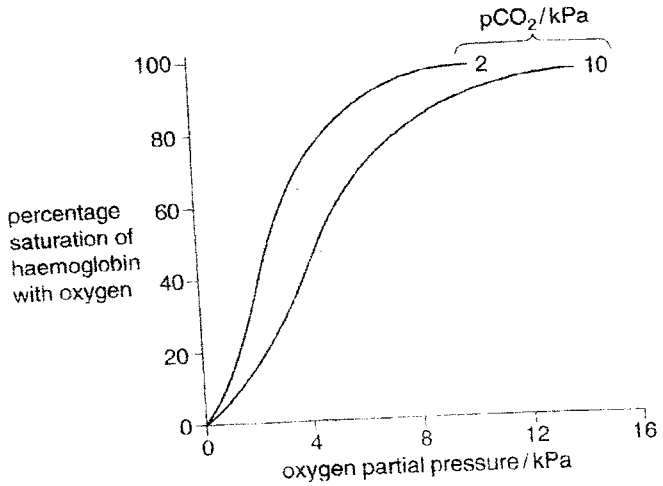
| | | |
|---|---|---|
| I | 1 | GTP |
| II | 4 | NADH |
| III | 3 | NADH |
| IV | 1 | $FADH_2$ |
| V | 2 | $FADH_2$ |

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

12 What is the relationship between the cow dung and the fungus, *Mucor* which grows on it?

A epiphytism
B saprophytism
C commensalism
D mutualism

13 The graph below shows haemoglobin-oxygen dissociation curves at two different partial pressures of carbon dioxide.



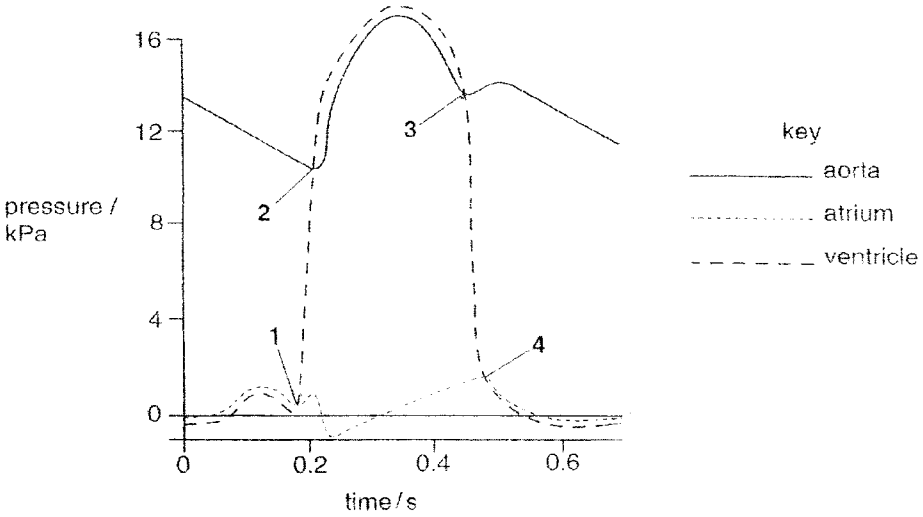

What is the advantage to the organism of the effect shown ?

A Haemoglobin removes more carbon dioxide from active tissues.
B Haemoglobin can release oxygen to myoglobin.
C High saturation of haemoglobin with oxygen is achieved in the lungs.
D Oxygen is more readily released into active tissues.

14 During an investigation on gaseous exchange, measurements were made on four people. The efficiency of gas exchange was the same in all four people. Which person absorbed most oxygen during four minutes of normal breathing?

| person | Breathing rate/breaths per minute | Tidal volume/$dm^3$ | Total lung volume/$dm^3$ |
|---|---|---|---|
| A | 14 | 0.6 | 6.4 |
| B | 15 | 0.6 | 6.0 |
| C | 16 | 0.5 | 6.4 |
| D | 17 | 0.4 | 5.8 |

15 The graph shows pressure changes in the aorta, the left ventricle and the left atrium.




Which statement is correct?

A At 1, a sound is heard.
B At 2, the semilunar valves close.
C At 3, nerve impulses from the pacemaker reach the ventricular wall muscles.
D At 4, the atrioventricular valves close.

16 Which of the following is correct?

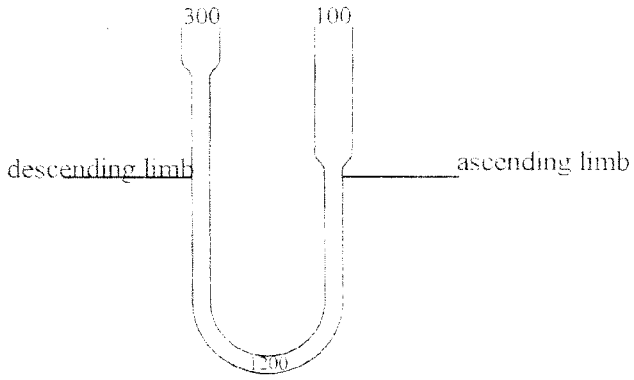
A The risk of coronary heart disease increases with moderate intake of unsaturated lipids.
B The risk of artherosclerosis decreases with alcohol consumption.
C There is a direct correlation between the risk of coronary heart disease and the amount of cholesterol in the blood.
D The risk of coronary heart disease is directly correlated to obesity.

17 Which of the following mechanisms best explains the movement of sugar and amino acid in the phloem?

I Water potential gradient
II Active transport
III Osmosis
IV Diffusion
V Capillary action

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

18 The diagram below shows the changes in osmotic concentration in mOsm $kg^{-1}$, in the loop of Henle. Which of the following causes a lowering of the osmotic concentration in the ascending limb?




A Sodium and chloride ions goes out of the ascending limb by active transport.
B Water diffuses out of the descending limb by osmosis.
C The descending limb is permeable to dissolved solutes.
D The ascending limb is permeable to water.

19 Which of the following reactions require addition of ammonia and carbon dioxide in formation of urea?

A arginine → urea
B arginine → ornithine
C ornithine → citrulline
D citrulline → arginine

20 The following events occur during muscle contraction.

I Hydrolysis of ATP molecules
II Impulse transmission along the T-tubules to the sarcoplasmic vesicles
III Formation of cross-bridges between myosin and actin filaments
IV Ratchet mechanism action develops
V Secretion of $Ca^{2+}$ ions by the sarcoplasmic vesicles
VI The intake of $Ca^{2+}$ ions by sarcoplasmic reticulum

Which one of the following shows the correct sequence of events during muscle contraction?

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

21 Among the following characteristics, which are true of the sympathetic system of the autonomous nervous system?

I The ganglia are located near the spinal cord, away from effectors
II Preganglionic nerves are long and postganglionic nerves are short
III Ganglia connect with larger ganglion called plexus
IV Its effect is more localized
V Norepinephrine is used in postganglionic nerves
VI One of its effect is dilation of the pupils

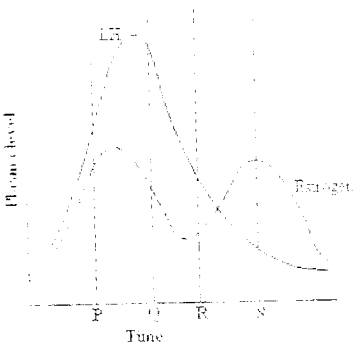
A I, II, IV and VI
B I, II, V and VI
C I, III, V and VI
D II, III and IV

22 During medical surgery, anaesthetics are used to reduce pain by blocking the transmission of nerve impulses. Which of these chemicals might work as an anaesthetic?

I A drug that mimics natural neurotransmitters
II A drug that opens voltage-gated $K^+$ channels
III A drug that blocks voltage-gated $Na^+$ channels in membranes
IV A chemical that blocks neurotransmitter receptors
V A chemical that induces the increase release of neurotransmitters

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

23 The graph below shows plasma hormone levels as a function of time. At which of the lettered points shown on the graph does ovulation occur in the oestrus cycle?




A P
B Q
C R
D S

24 How do steroid hormones alter the activity of specific target cells?

I By transferring information to a particular molecule which acts as a second messenger in the cell
II By entering target cells and triggering specific gene activation
III By digesting the plasma membrane of the target cells
IV By digesting the lysosomes of the target cells

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

25 Which of the following shows the correct major effects of plant growth substances?

| Class of plant growth substance | Major effect on plant growth |
|---|---|
| I Abscisin | (a) Stimulates fruit ripening |
| II Auxin | (b) Inhibit growth of lateral shoots |
| III Cytokinin | (c) Prolong seed dormancy |
| IV Ethene | (d) Stimulate fruit development |
| V Gibberellin | (e) Inhibit senescence of leaves |

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

26 Which of the following statements are true of phytochrome?

I To show its effect, phytochrome channels light energy to chlorophyll a
II It can exist in two interconvertible forms
III One form, the blue pigment, absorbs red light whereas the other form, the blue-green pigment, absorbs infra-red light
IV Phytochrome is a large conjugated protein
V Phytochromes makes up the photosystems of photosynthesis

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

27 The following are events occurring in humoral-mediated immunity.

I Antibodies and memory cells are produced
II B cells divide and give rise to clones.
III Activated T helper cell interacts with B cells displaying same antigen complex
IV Cells differentiate, forming plasma cells
V B cells are activated

Which one of the following shows the correct sequence of events?

A II→V→III→I→IV
B III→II→V→IV→I
C III→V→II→IV→I
D V→IV→III→I→II

28 The table below lists the types of blood cell involved in the immune response and explanations of their actions.

| Type of blood cell | Action |
|---|---|
| I T helper cell | (f) Engulfs bacteria and virus |
| II Memory cell | (g) Produces antibodies |
| III Plasma cell | (h) Activates T cells and B cells |
| IV T cytotoxic cell | (i) Release perforin to disintegrate affected cells |
| V Macrophage | (j) Divides rapidly to become clone cells when encountering antigens |

Which of the following is correct of the match between blood cell type and its action?

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

29 HIV affects the immune system mainly by infecting

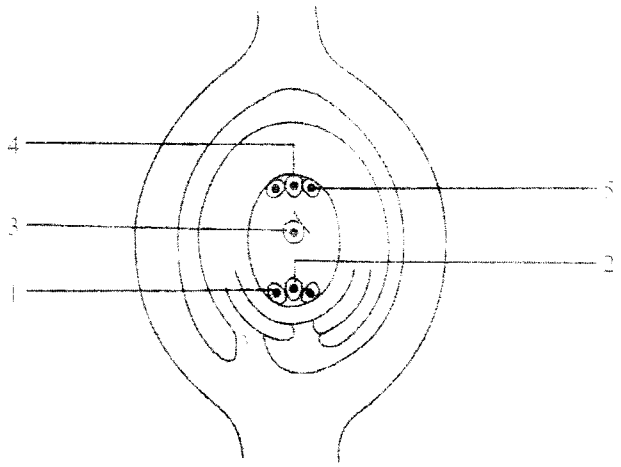
A B cells.
B suppressor T cells.
C helper T cells.
D cytocytic T cells.

30 Which of the following are functions of progesterone?

I inhibit secretion of FSH
II stimulates thickening of endometrium
III stimulates ovulation
IV stimulates development of Graafian follicle
V stimulates growth of glands

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

31 The diagram below shows a longitudinal section of a plant ovule. Which structure are involved in double fertilization?




A 1 and 2
B 2 and 3
C 2 and 5
D 3 and 4

32 The table below shows four types of asexual reproduction and four examples of animal. Which of the following combinations is correct?

| Reproduction methods | Animals |
|---|---|
| I. sporulation | (a) honey bee |
| II. polyembryony | (b) hydra |
| III. parthenogenesis | (c) amoeba |
| IV. budding | (d) *Fasciola* |

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

33 The table below gives the types of growth and examples of growth in organisms. Which of the following combinations is true?

| Type of growth | Examples |
|---|---|
| I. allometric | (a) increase in size of baby to become an adult |
| II. isometric | (b) increase in size of zygote to become a blastula |
| | (c) increase in weight of a child |
| | (d) increase in number of cells of a zygote |

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

34 The comb shapes of domestic fowls is controlled by two pairs of alleles *P*, *p* and *R*, *r*, which interact with one another. The pea comb is produced when only *P* is present without *R*: the rose comb is produced when *R* is present without *P*: the walnut comb is produced when both *P* and *R* are present and the single comb is produced when both *P* and *R* are absent.
In a cross between the walnut variety and the rose variety, all offspring are walnut-combed. What is the possibility of the parental genotypes?

A *PpRr* x *ppRR*
B *PPRr* x *ppRR*
C *PpRR* x *ppRR*
D *PpRR* x *ppRr*

35 The table below shows the value of chromosome crossing over between linked genes.

| *Linked genes pair* | PQ | PR | PS | QR | QS | RS |
|---|---|---|---|---|---|---|
| *Value of chromosome crossing over/%* | 60 | 10 | 20 | 70 | 40 | 30 |

The genes sequence on the chromosome is

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

36 If the original sequence of chromosome is L M N O P Q R S and two chromosomal mutations occur, resulting in the sequence of L N M O P R S, what type of mutations have occurred?

A Two translocations
B Two inversions
C Two deletions
D One inversion and one deletion

37 XYY syndrome is formed from

A ovum that has non-disjunction of X chromosome
B sperm that has non-disjunction of sex chromosome in Meiosis I
C sperm that has non-disjunction of Y chromosome in meiosis II
D zygote that has non-disjunction of sex chromosome

38 A dominant allele Y for yellow coat in rat functions as a lethal gene in homozygous state. If 16% of 1000 foetuses are stillborn, what percentage is expected to be heterozygous in the population?

A 4
B 16
C 24
D 48

39 Which statement about *E.coli* which has regulatory gene that has undergone mutation is true?

A Only β-galactosidase is produced
B Repressor produced binds with operator gene
C RNA polymerase is unable to bind with promoter gene
D *E.coli* produces β-galactosidase, permease, and transacetylase constitutively

40 Which of the following statements are true of lactose operon hypothesis?

I Repressor protein is synthesized under the control of regulatory gene
II Lactose induces transcription by preventing the repressor action
III Lactose operon operator is mRNA which is transcripted from RNA
IV Gene expression in operon depends on the concentration of the promoter molecule

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

41 Which of the following is(/are) the role(s) of restriction enzyme in the cloning process?

I Digest DNA lygase
II Cut DNA vector
III Cut target DNA
IV Cut the cloned DNA from its vector

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

42 Which of the following is(/are) the use(s) of DNA recombinant?

I Produce sheep clone
II Produce agriculturally important plants and animals which have better nutritional values
III Produce plants that have bacterial genes to destroy pathogenic insects
IV Produce microbes which secrete enzymes to overcome the problems of oil spillage in the sea

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

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

I Division is equivalent to phylum
II Organisms of the same family belong to the same order
III Organisms of the same genus are the species that are closely evolutionary related
IV The species that interbreed is closely evolutionary related compared to the organisms of the same genus

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

44 Which combination is homologous?

| Filicinophyta | Angiospermophyta |
|---|---|
| (a) Microspore<br>(b) Megasporangium<br>(c) Megagametophyte<br>(d) Megasporophyll<br>(e) Strobilus | i. Ovary<br>ii. Pollen grain<br>iii.Carpel<br>iv. Flower<br>v. Embryo sac |

| | (a) | (b) | (c) | (d) | (e) |
|---|---|---|---|---|---|
| A | ii | i | v | iii | iv |
| B | iii | ii | i | v | iv |
| C | iv | i | ii | v | iii |
| D | v | i | ii | iii | iv |

45 Which feature distinguishes the spider from the housefly?

A Triploblastic coelomate
B Perivisceral cavity is haemocoel
C Open circulatory system with a dorsal heart
D The fourth to seventh segments have a pair of appendages each

46 The following are events which occurred in evolution.

I Struggle for existence
II Inheritance of favoured phenotypes
III Constancy of population size
IV Speciation

Which order supports Darwin's theory of evolution?

A I → III → II→ IV
B III → I → II→ IV
C II → I → IV→ III
D IV → I → II→ III

47 Which of the following statements are true of the inheritance of body mass and height in humans?

I Phenotypic variation is continuous
II The inheritanee of the characters are polygenic inheritance
III The inheritance of the characters is controlled by a series of multiple alleles
IV Only one or two gene loci are involved

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

48 Which of the following are features of an organism using the K strategy to control the size and distribution of its population?

I Shows high competitive capabilities
II Has high efficiency in exploiting natural resources
III Have large clutch sizes with relatively small offspring
IV Has long life-cycle
V Be found in environments that are highly variable

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

49 Which of the following statements appropriately describe a trophic level of an ecosystem?

I Structured feeding relationship
II Who eats whom in an ecosystem
III A hierarchy of energy transfers
IV The recycling of nutrients

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

50 Which of the following statements correctly describe 'in-situ conservation'?

I Seed storage of genetically diverse crops
II Breeding captive species in zoos
III Preserving biological diversity in the wild
IV Conservation exclusively on large, charismatic animals

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