



SMJK SAM TET, IPOH, PERAK

STPM TRIAL EXAMINATIONS 2009
BIOLOGY 964/1
1 HOUR 45 MINUTES

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Instructions: There are **fifty** questions in this paper. For each question, four suggested answers are given. Choose **one** correct answer and indicate it on the answer sheet provided. Answer all questions.

1. Which of the following are the characteristics of steroids?

- I Hydrophobic
 - II Consists of four fused rings and choline
 - III Cannot pass through the plasma membrane
 - IV Can activate genes to produce specific proteins
- A I and III only C I, II and IV
B I and IV only D II and IV only

2. The table below shows the components of a cell membrane and their functions.

| Components of cell membrane | Functions |
|-----------------------------------------|-----------------------------------------------------------------------------------------|
| I Channel proteins and carrier proteins | (p) act as cell identity markers |
| II Glycoproteins | (q) involved in the selective transport of polar molecules and ions across the membrane |
| III Cholesterol | (r) gives the membrane its selectively permeable characteristic |
| IV Phospholipid | (s) maintains the fluidity of the membrane |

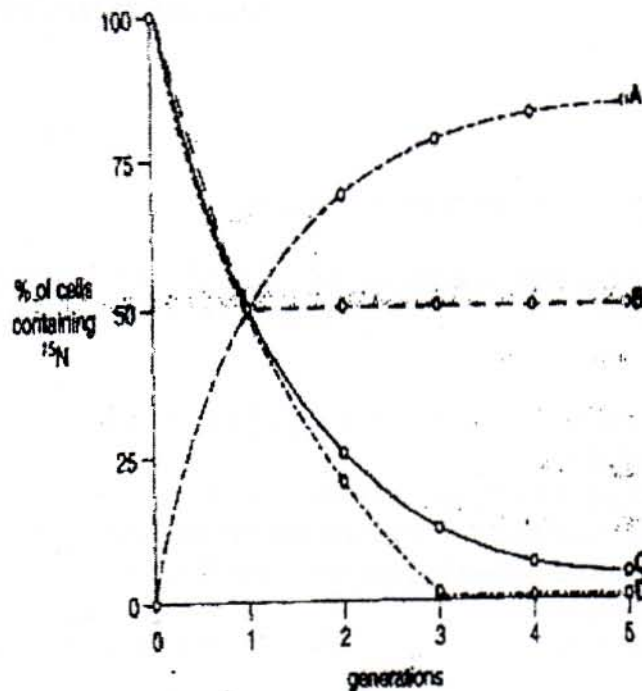
Which of the following is the correct combination?

- | | I | II | III | IV |
|---|-----|-----|-----|-----|
| A | (p) | (q) | (r) | (s) |
| B | (q) | (p) | (s) | (r) |
| C | (r) | (p) | (s) | (q) |
| D | (s) | (r) | (q) | (p) |

3. Which diagram shows the appearance of a cell with an original ψ of -1.2MPa , after being placed in a solution as shown



4. Bacteria were cultured in a medium containing heavy nitrogen (^{15}N) until all the DNA was labeled. These bacteria were then grown in a medium containing only normal nitrogen (^{14}N) for five generations. The percentage of cells containing ^{15}N in each generation was estimated. Which curve provides evidence that DNA replication is semi-conservative?

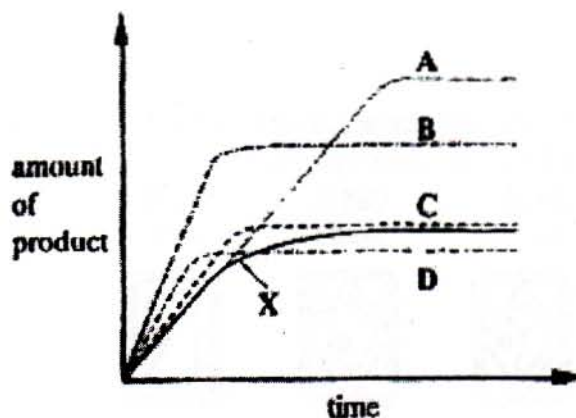


5. Which of the following are the effects of a competitive inhibitor on a reaction catalyzed by enzyme?

- | | |
|-----|------------------------------------------------------------------|
| I | The K_m is increased. |
| II | The V_{max} is not changed. |
| III | The inhibitor binds to an allosteric site on the enzyme. |
| IV | Increased concentration of substrate can reverse the inhibition. |
| A | I, II and III |
| B | I, II and IV |
| C | I, III and IV |
| D | II, III and IV |

6. Line X shows the activity of an enzyme at 20°C . Lines A to D show the effects of different conditions on the activity of the enzyme.

Which line shows the effect of increasing the temperature by 10°C and adding extra substrate?



7. What is an advantage of DNA having two complementary strands?

- A Diploid cells can inherit DNA from both parents.
- B Pairing can occur between chromatids
- C Semi-conservative replication is possible
- D Transcription and replication can occur simultaneously.

8. An mRNA codon for the amino acid alanine is GCC. How many alanine molecules are present in the polypeptide, containing eight amino acids, coded for by the following DNA template?

DNA template: TCGGCCTACCGGGCCCATGCCAAT

- A 0 B 1 C 2 D 3

9. Which of the following about cyclic photophosphorylation and non-cyclic photophosphorylation is correct?

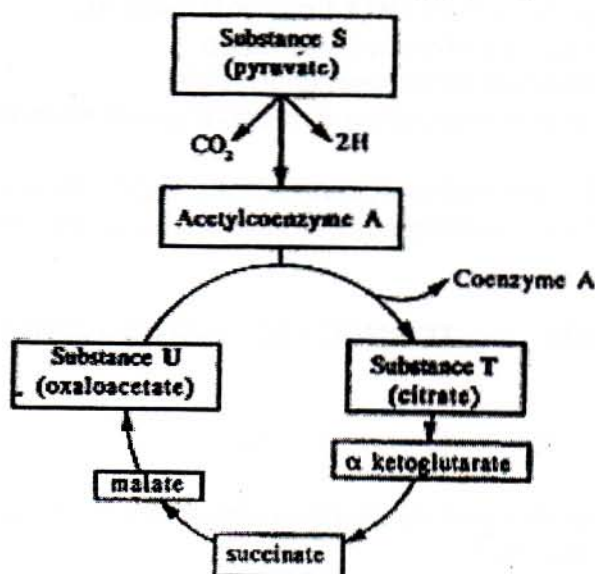
| | Cyclic photo-phosphorylation | Non-cyclic photophosphorylation | Cyclic and non-cyclic photophosphorylation |
|---|------------------------------|---------------------------------|--------------------------------------------|
| A | NADPH is not formed | Oxygen is produced | ATP is produced |
| B | Oxygen is produced | ATP is produced | NADPH is not formed |
| C | ATP is produced | Oxygen is produced | NADPH is not formed |
| D | NADPH is not formed | ATP is produced | Oxygen is produced |

10. Which of the following statements are correct regarding the photosynthetic adaptations of cactus plants?

- I Stomata are closed at night
- II During the day, carbon dioxide combines with phosphoenolpyruvate to form malate.
- III Malate is stored in the vacuole of mesophyll cell at night.
- IV During the day, Calvin cycle occurs.

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

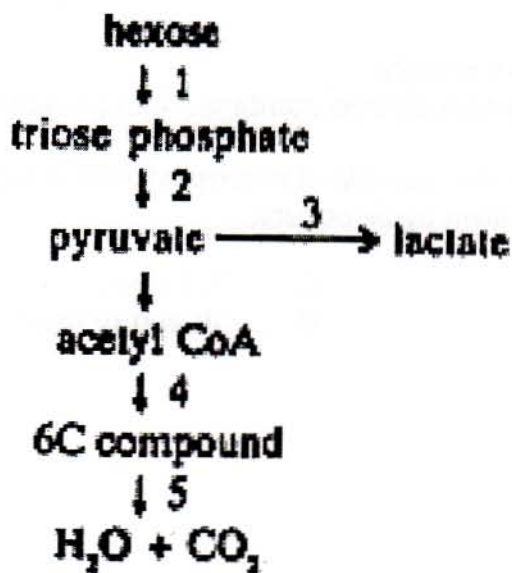
11. The diagram shows some of the reactions following glycolysis during aerobic respiration.



How many carbon atoms are in each of the substances S, T and U?

| | S | T | U |
|---|---|---|---|
| A | 2 | 5 | 3 |
| B | 2 | 6 | 4 |
| C | 3 | 4 | 6 |
| D | 3 | 6 | 4 |

12. The diagram summarises the pathway of glucose breakdown. Which two steps result in a net increase of ATP?



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

13. Carbon dioxide in the blood is transported in the form of

- I carbonic acid
- II carbamino-haemoglobin
- III carboxyhaemoglobin
- IV hydrogen carbonate ions

A I and IV only

B II and III only

C I, II and IV

D I, III and IV

14. The following five events occur during the cardiac cycle in humans.

- 1 ventricular diastole
- 2 bicuspid and tricuspid (atrioventricular) valves forced open
- 3 blood forced back against bicuspid and tricuspid valves
- 4 blood forced back against semilunar valves
- 5 atrial systole

What is the correct sequence of these events?

| | first → last | | | | |
|----------|--------------|----------|----------|----------|----------|
| A | 2 | 5 | 3 | 4 | 1 |
| B | 3 | 2 | 4 | 5 | 1 |
| C | 4 | 1 | 2 | 3 | 5 |
| D | 5 | 2 | 3 | 1 | 4 |

15. When diabetics inject themselves with insulin, which event will occur in the liver?

- A an increase in the synthesis of lipid and polysaccharide molecules
- B a decrease in the permeability of the cells to glucose
- C a decrease in the rate of uptake of amino acids and protein synthesis
- D an increase in the breakdown of glycogen

16. Which of the following substances is **incorrectly** matched with its producer?

- A angiotensinogen – liver
- B ADH – hypothalamus
- C aldosterone – kidney
- D renin – juxtaglomerular apparatus

17. The following are events that occur during muscle contraction.

- I calcium ions bind to troponin
- II binding forms between actin and myosin
- III calcium ions are released from the sarcoplasmic reticulum
- IV tropomyosin moves exposing the myosin binding site

Which of the following sequences describes **correctly** the events that occur during muscle contraction?

A III, I, IV and II

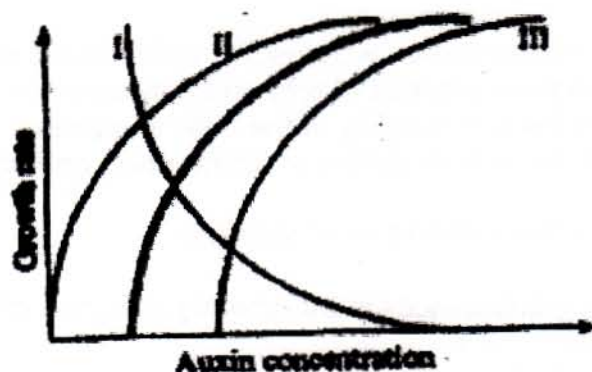
B I, IV, II and III

C II, IV, I and III

D IV, I, II and III

18. A drug might act as a stimulant of the somatic nervous system if it
- A makes the membrane permanently impermeable to sodium.
 - B increases the sensitivity of the postsynaptic membrane to acetylcholine.
 - C stimulates the activity of acetylcholinesterase in the synaptic cleft.
 - D increases the release of substances that cause the hyperpolarization of the neurons.
19. All the following statements about gametogenesis are true **except**
- A Spermatogenesis continues throughout the male's life; oogenesis stops at menopause.
 - B Oogenesis results in one ovum, while spermatogenesis results in millions of sperms.
 - C The primary spermatocyte is a haploid cell.
 - D The process of oogenesis is completed when the egg cell is penetrated by the sperm.
20. Which of the following hormones is **incorrectly** paired with its action?
- A progesterone – stimulates follicles to develop
 - B GnRH – controls the release of FSH and LH
 - C oestrogen – responsible for primary and secondary female sex characteristics
 - D human chorionic gonadotrophin – maintains secretions from the corpus luteum

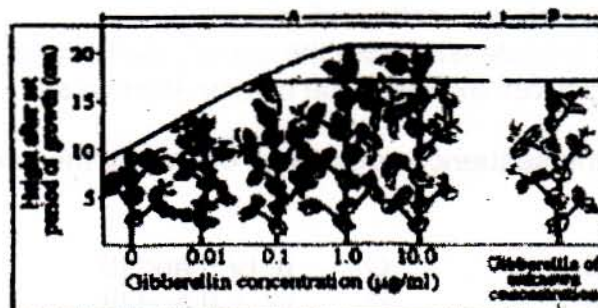
21.



The heavy (dark) line in the figure above illustrates the relationship between auxin concentration and cell growth in stem tissues. If the same range of concentrations was applied to lateral buds, what curve would probably be produced?

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

22.



Gibberellin of unknown concentration

The results of this experiment shown on the left of the graph (area A) may be used

- A to show that these plants can live without gibberellin.
- B to show that gibberellin is necessary in positive geotropism(gravitropism).
- C to show that taller plants with more gibberellin produce fruit (pods).
- D to show a correlation between plant height and gibberellin concentration.

23. Which of the following are the characteristics of epitopes?

- I There can be more than one on an antigen
- II They have specific configuration
- III Virus generally has more surface epitopes compared to bacteria
- IV Specific antibody can bind to epitopes

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

24. Why is passive immunity effective for only a short time?

- A antibodies are rapidly broken down
- B antigens are rapidly broken down
- C memory cells soon die
- D phagocytes soon die

25. Which of the following enables the HIV virus to remain dormant in the human body?

- A The virus rests in the cytoplasm of T₄ cells
- B The viral DNA integrates into the DNA of T₄ cells
- C The viral RNA takes some time to replicate
- D The viral reverse transcriptase is engulfed by the T₄ cell

26. Which structural feature(s) is/are characteristic of viruses?

- I DNA or RNA
 - II A protein coat
 - III Ribosomes
- A I only
B I and II only
C II and III only
D I, II and III

27. What are *Allium sativa* and *Allium cepa*?

- A Two different species of the same genus
- B The same species of the same genus
- C The same species but of a different genus
- D Two different species of a different genus

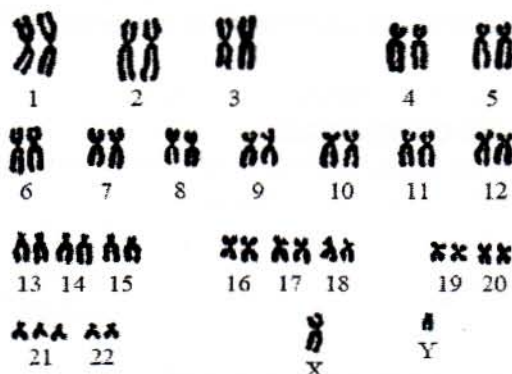
28. After fertilization what is the correct order of events?

- A Embryo secretes HCG → implantation of embryo in uterine wall → stimulates corpus luteum to grow
- B Implantation of embryo in uterine wall → stimulates corpus luteum to grow → embryo secretes HCG
- C Implantation of embryo in uterine wall → embryo secretes HCG → stimulates corpus luteum to grow
- D Continued secretion of progesterone and estrogen → embryo secretes HCG →

stimulates corpus luteum to grow → implantation of embryo in uterine wall

- 29 Which process starts the germination of a starchy seed?
- A Production of gibberellin
 - B Absorption of water
 - C Maltose is converted to glucose water
 - D Production of amylase

- 30 The diagram below is a karyotype of a human.



- Which statement about the karyotype is correct?
- A Non-disjunction has occurred and the individual is female.
 - B Non-disjunction has not occurred and the individual is female.
 - C Non-disjunction has occurred and the individual is male.
 - D Non-disjunction has not occurred and the individual is male.
- 31 In *Drosophila* the allele for normal wings (W) is dominant over the allele for vestigial wings (w) and the allele for normal body (G) is dominant over the allele for ebony body (g). If two *Drosophila* with the genotypes $Wwgg$ and $wwGg$ are crossed together, what ratio of phenotypes is expected in the offspring?
- A 9 × normal wings, normal body : 3 × normal wings, ebony body : 3 × vestigial wings, normal body : 1 × vestigial wings, ebony body
 - B 3 × normal wings, normal body : 3 × normal wings, ebony body : 3 × vestigial wings, normal body : 1 × vestigial wings, ebony body
 - C 3 × normal wings, normal body : 1 × normal wings, ebony body : 3 × vestigial wings, normal body : 1 × vestigial wings, ebony body
 - D 1 × normal wings, normal body : 1 × normal wings, ebony body : 1 × vestigial wings, normal body : 1 × vestigial wings, ebony body
- 32 All of the statements are correct regarding alleles except
- A A gene can have more than one allele.
 - B Two identical alleles are said to be heterozygous with respect to that gene.
 - C Alleles are found on corresponding loci of homologous chromosomes.
 - D Alleles are alternative form of the same gene.
- 33 In garden peas, the pairs of alleles coding for seed shape and seed colour are unlinked. The allele for smooth seeds (S) is dominant over the allele for wrinkled seeds (s). The allele for yellow seeds (Y) is dominant over the allele for green seeds (y).
- If a plant of genotype $Ssyy$ is crossed with a plant of genotype $ssYy$, which offspring are recombinants?
- A $SsYy$ and $Ssyy$
 - B $SsYy$ and $ssYy$
 - C $SsYy$ and $ssyy$

- D** Ssyy and ssYy
- 34 What constitutes a linkage group?
- A** Genes carried on the same chromosome.
B Genes whose loci are on different autosomes.
C Genes controlling a polygenic characteristic.
D Alleles for the inheritance of ABO blood groups.
- 35 What are homologous chromosomes?
- A** Two chromosomes with differing sets of genes, in the same sequence, with the same alleles.
B Two chromosomes with the same set of genes, in a different sequence, with the same alleles.
C Two chromosomes with a different set of genes, in the same sequence, with different alleles.
D Two chromosomes with the same set of genes, in the same sequence, sometimes with different alleles.
- 36 In a study of a population of prawns, the mean mass is 12.3 g and the standard deviation is 1.2. Which conclusions can be made about the population?
- I** 68% of the population has masses of 12.3g – 14.7g.
II 68% of the population has masses of 11.1g – 13.5g.
III 95% of the population has masses of 12.3g – 14.7g.
IV 95% of the population has masses of 9.9g – 14.7g.
- A** I and III
B I and IV
C II and III
D II and IV
- 37 Cystic fibrosis is a recessive condition that affects about 1 in 2 500 babies in the Caucasian population of the United States. Calculate the percentage of individuals who are carriers in the population.
- A** 4%
B 98%
C 2%
D 40%
- 38 The transgenic plant is different from the wild type plant because
- A** it is tetraploid.
B it is formed by interbreeding of two different plants.
C it contains a foreign gene in their genomes.
D It contains cDNA.
- 39 Which of the following would cause phenotypic variation among organisms of the same genotype?
- A** Mutation
B Exposure to different environments
C Continuous variation within the species
D Different varieties of the same species.
- 40 Which of the following is likely to be radially symmetrical?
- A** An annelid
B An arthropod
C A chordate

D A platyhelminth

41 The diagram shows a food chain in a pond ecosystem.

Duckweed → **Larva** → **Beetle** → **Frog**

What is the reason for the limit to the number of trophic levels in this food chain?

- A The number of frogs in the pond.
- B The biomass of the duckweed.
- C The high percentage of energy loss at each level due to various activities.
- D The net productivity of the duckweed is limited due to its small size.

42 The lung of a reptile and the air bladder of a fish are

- A Analogous structures
- B Homologous structures
- C Vestigial structures
- D Divergent evolution

43 According to Darwin's theory of evolution, what causes the struggle for survival in populations?

- A Overproduction of offspring
- B Favourable heritable variations
- C Natural selection
- D Competition between the fittest individuals in the population

44 Which processes result in the greatest amount of genetic variation in a population?

- A Natural selection and meiosis
- B Meiosis and mutation
- C Mutation and mitosis
- D Mitosis and natural selection

45 Which factors can limit population growth?

- I Shortage of food
- II Increased genetic variation in the population
- III Increase in predators
- IV Increase in diseases and parasites

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

46 Which series of ecological units is in the correct order of decreasing biomass?

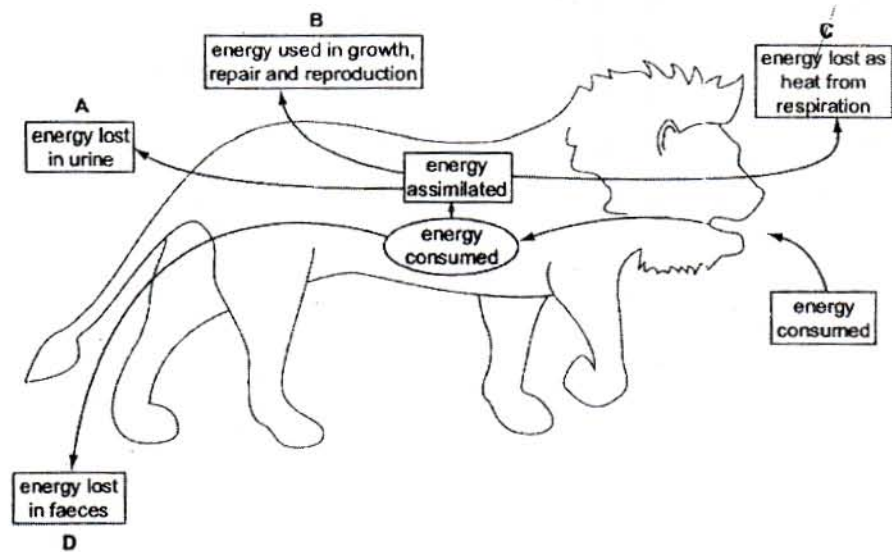
- A Ecosystem, population, community, individual
- B Biosphere, ecosystem, population, individual
- C Community, biosphere, population, individual
- D Biosphere, ecosystem, population, community

47 Net primary productivity in most ecosystems, is important because it represents the

- A surplus energy generated by producers.
- B total solar energy converted to chemical energy by producers.
- C energy used in respiration by heterotrophs.
- D energy available to producers.

48

Of the prey consumed by the lion, into which box does the largest amount of energy go?



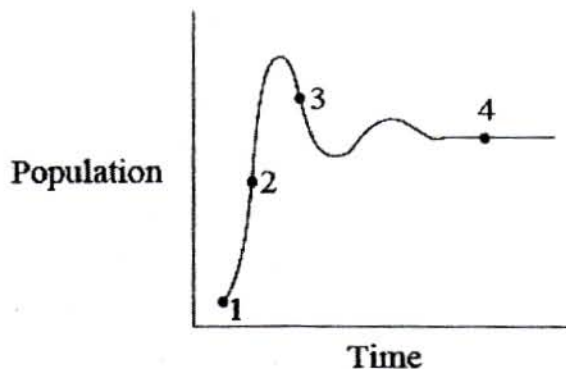
49

A researcher captures 100 sparrows (a small bird), tags them and then releases them. One week later, the researcher recaptures 50 sparrows, 20 of which have tags on them. What is the size of the sparrow population?

- A 50 birds
- B 100 birds
- C 250 birds
- D 500 birds

50

Consider the following diagram of a population growth curve.



At what point is mortality greater than natality?

- A 1
- B 2
- C 3
- D 4

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