INSTRUCTIONS TO CANDIDATES

· Do not open this examination paper until instructed to do so.
· You are not permitted access to any calculator for this paper.
· Section A: choose the answer you consider to be the best and cross your choice on the answer sheet provided.
· Section B: answer all questions in the boxes provided. Unless otherwise stated in the question, all numerical numbers should be given exactly or correct to three significant figures.
· The maximum mark for this examination paper is [70 marks].
SECTION A

Answer all questions in the answer sheet provided. (Total: 40 marks)

1. The overall shape of a bacterial cell is determined by which of the following?
   a. cell wall
   b. nucleoid
   c. cell surface membrane
   d. None of the above

2. Which of the following statements is correct?
   a. animal and fungal cells contain chloroplasts
   b. animal and plant cells do not contain mitochondria
   c. plant, animal and fungal cells possess mitochondria
   d. all plant cells contain chloroplasts

3. Which of the following are not found in plant cells?
   a. mitochondria
   b. glyoxysomes
   c. centrosomes
   d. golgi apparatus

4. The term “nuclear envelope” is more correct than the term “nuclear membrane” because
   a. the enclosure has pores which membranes do not
   b. the enclosure is made up of two membranes
   c. the chemical composition is inconsistent with cellular membranes
   d. No answer. The two terms are interchangeable
5. With which of the following are basal bodies **NOT** associated?
   a. animal cells
   b. plant cells
   c. microtubules
   d. centrioles

6. The cytoplasm of a bacterium
   a. is supported by cytoskeleton
   b. is supported by microtubules
   c. is supported by keratin
   d. is none of the above

7. ATP (adenosine triphosphate) can be termed the universal energy currency in life because it:
   a. enables cells to disobey the first law of thermodynamics
   b. enables cells to disobey the second law of thermodynamics
   c. releases energy as heat when it undergoes hydrolysis
   d. is none of the above

8. Water constitutes about 70% of a typical cell. Water is able to form hydrogen bonds, which are:
   a. covalent bonds between hydrogen atoms
   b. covalent bonds between hydrogen and oxygen atoms
   c. strong electrostatic bonds between positive hydrogen ions and negative oxygen ions
   d. weak electrostatic bonds between partially charged hydrogen and oxygen atoms
9. The synthesis of proteins involves polymerisation of:
   a. amino acids
   b. glucose
   c. monosaccharides
   d. nucleotides

10. A codon is:
   a. a group of 4 different bases in the mRNA
   b. a group of 3 nucleotides that codes for amino acid
   c. one of the amino acids in proteins
   d. the things that make proteins

11. What is the role of mRNA during protein synthesis?
   a. translation
   b. transportation
   c. translocation
   d. transfer

12. What does the enzyme tRNA-amino acid synthetase do?
   a. releases amino acids from their cognate tRNAs
   b. links amino acids to the anticodon of their cognate tRNAs
   c. links amino acids to the codon of their cognate tRNAs
   d. links amino acid to the acceptor stem of their cognate tRNAs

13. An allele is:
   a. word interchangeable for gene
   b. homozygous genotype
   c. heterozygous genotype
   d. one of the several possible forms of a gene
14. Phenotype refers to what of an individual:
   a. genetic makeup
   b. actual physical appearance
   c. projected physical appearance
   d. recessive alleles

15. Assuming from the diagram below that both parent plants are homozygous, what would be the reason why all of the f1 generation have yellow phenotypes?

   a. because the f1 genotypes are homozygous
   b. because the f1 genotypes are heterozygous
   c. yellow is dominant allele
   d. both parents possessed and passed on yellow alleles.

16. What does meiosis create?
   a. 2 identical daughter diploid cells
   b. 2 identical daughter haploid cells
   c. 4 granddaughter diploid cells
   d. 4 granddaughter haploid cells
17. Crossing-over takes place during
   a. meiosis
   b. mitosis
   c. segregation
   d. linkage

18. The scientist credited with the title of “father of genetics” is
   a. Gregor Mendel
   b. Sir Thomas Hunt
   c. Albert Einstein
   d. Sir Isaac Newton

19. Which muscles contract to cause air to pass into the lungs through the trachea?
   a. internal intercostal muscles and diaphragm
   b. internal intercostal muscles and abdomen wall muscle
   c. external intercostal muscles and diaphragm
   d. external intercostal muscles and abdomen wall muscle

20. Which of the following is NOT true concerning capillaries?
   a. they are the site of exchange between blood and body cells
   b. they have walls that are only one cell thick
   c. their diameter is so small that red blood cells must move through them in single file
   d. they have valves to prevent blood from flowing backwards into them
21. What is the role of the pacemaker or sinoatrial node (SAN)?
   a. to initiate contraction of the ventricle
   b. to pass the excitation through Purkinje fibres
   c. to originate excitation in myogenic muscle
   d. to cause the relaxation of the atria

22. A blood clot contains a network of protein. What is the protein?
   a. fibrin
   b. fibrinogen
   c. haemoglobin
   d. thrombin

23. Which hormone is produced by adipose (fat) tissue in the body?
   a. thyroxine
   b. leptin
   c. melatonin
   d. insulin

24. Produced by the pancreas, what breaks down polypeptides into smaller polypeptides
   a. lipase
   b. pepsin
   c. amylase
   d. trypsin
25. What generates new cells in dicotyledonous plants?
   I. apical meristems
   II. lateral meristems
   III. phloem

   a. I only
   b. II only
   c. I and II
   d. I, II, and III

26. Plants develop brightly coloured flowers to attract animals. Which process is directly assisted by this adaptation?
   a. seed dispersal
   b. pollination
   c. fertilization
   d. germination
27. What are the differences between monocotyledonous and dicotyledonous plants?

<table>
<thead>
<tr>
<th>Monocotyledonous</th>
<th>Dicotyledonous</th>
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</thead>
<tbody>
<tr>
<td>a. parallel venation; floral organs in multiples of 4 or 5</td>
<td>net-like venation; floral organs in multiples of 3</td>
</tr>
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<td>b. net-like venation; floral organs in multiples of 3</td>
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28. Which of the following seed structure functions as a nutrient storage?
   a. embryo shoot
   b. testa
   c. cotyledons
   d. micropyle

29. Which of the following vascular tissue is responsible for the transport of sugars from source tissues?
   a. xylem
   b. phloem
   c. cork cambium
   d. vascular cambium
30. What would be the term to describe all the frogs in a freshwater lake?
   a. ecosystem
   b. population
   c. habitat
   d. community

31. What is the difference between a food chain and a food web?
   a. a food chain shows some relationship between animals in a community
   b. a food chain shows the amount of energy transfer between consumers
   c. a food web shows the feeding relationships between animals present in the same community
   d. a food chain takes place in a community while a food web takes place in a population

32. Which of these relationships results in harm to one of the species involved?
   I. Commensalism
   II. Predation
   III. Herbivory

   a. I only
   b. III only
   c. I and II
   d. II and III

33. What is not the external feature of filicinophyta?
   a. roots and rhizoids are absent
   b. vascular tissue used for conducting water
   c. the leaves are tightly coiled up
   d. are well adapted to terrestrial conditions
34. What is true about binomial system of nomenclature?
   a. in typed or printed text, it is written in capital letter
   b. it is abbreviated to the initial letter of the species name with the full genus name when it has been used twice in a text
   c. the original name consists of three words
   d. the genus name begins with an uppercase letter

35. Which is not the an animal phylum?
   a. cnidaria
   b. arthropods
   c. platyhelminthes
   d. bryophyta

36. Which of the factors form the basis of natural selection?
   a. random mating
   b. limited environmental resources
   c. stable genotype frequencies over time
   d. crossing over in meiosis

37. What is correct about the temporal isolation in evolution?
   a. an example is a mountain range or ocean
   b. it is when females does not find the males of the other population seductive enough to be potential mates and leads to temporal isolation
   c. an example is when female parts of the flowers of one population of plants reach maturity at a different season compared with the release of pollen of another population
   d. it is when populations of a species breed at the same time
38. In which of the following habitats are you least likely to find fossils?
   a. swamps
   b. tropical forest
   c. desert
   d. deep ocean

39. The wings of which of the following is not homologous?
   a. penguin
   b. fly
   c. eagle
   d. chicken

40. *Ranunculus repens* and *Hypericum repens* both have yellow flowers. Which statement is true?
   a. they are angiospermophytes
   b. they are coniferophytes
   c. they are members of the same species
   d. they are members of the same genus
Section B

Answer all questions in the box provided. (Total: 30 marks)

1. [Maximum mark: 4]

Compare and contrast the differences of the characteristics of prokaryotic and eukaryotic cells.
Looking at the pedigree chart for Queen Victoria, what is the probability that the unknown first offspring of Alice (daughter of Leopold) to be a carrier female and what type of disease would it be?
3. [Maximum mark: 4]
Contrast between type I pneumocytes and type II pneumocytes.

4. [Maximum mark: 4]
State how much energy made available by producers passes to primary consumers and why.
5. [Maximum mark: 4]
Discuss the process of endocytosis.
6. [Maximum mark: 10]
When there is an excess of substrate present in an enzyme-catalysed reaction in room temperature, explain the effect on the rate of reaction of increasing the concentration of: (also sketch graphs for each aspect)
   a. the substrate [3]
   b. the enzyme [4]
   c. raising the temperature [3]