

**UNIVERSITY OF BOLTON**  
**SCHOOL OF SPORT AND BIOLOGICAL SCIENCES**  
**BSc (Hons) MEDICAL BIOLOGY WITH FOUNDATION**  
  
**SEMESTER ONE EXAMINATIONS 2018/19**  
  
**CHEMISTRY OF LIFE**  
  
**MODULE NO: BIO3022**

Date: Wednesday 16 January 2019

Time: 2.00 pm – 3.30 pm

**INSTRUCTIONS TO CANDIDATES:**

Candidates are advised that the examiners attach importance to legibility of writing and clarity of expression. **YOU ARE STRONGLY ADVISED TO PLAN YOUR ANSWERS**

There are **TWO** sections.

Answer **ALL** questions from **BOTH** Sections (Section A and Section B).

Write all answers in answer booklet.

Marks for parts of questions are shown in brackets.

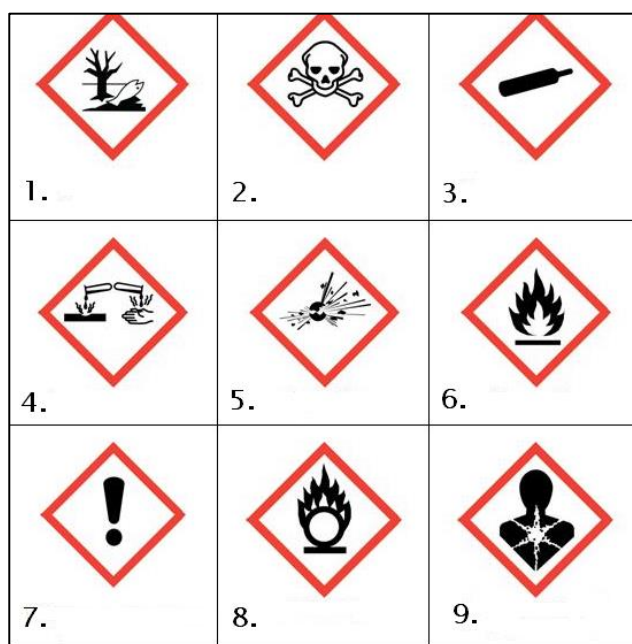
This examination paper carries a total of 100 marks.

All working must be shown. A numerical solution to a question obtained by programming an electronic calculator will not be accepted.

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**SECTION A: Answer ALL questions in this section; 1 mark per question, 40 marks in total.**

1-9. State what each of the symbols labelled 1-9 in the image below means.



(9 Marks)

10. Which symbol (above) is used on strong acids and alkalis?

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11. PPE includes:

- a) Laboratory coats.
- b) Goggles.
- c) Vinyl gloves.
- d) All the above.

12. Which of the following statements is false?

- a) Micropipettes are very accurate.
- b) Measuring cylinders are very accurate.
- c) Volumetric flasks are very accurate.
- d) a and c only.

13. Atomic number is:

- a) The number of protons found in the nucleus of an atom.
- b) The number of atoms of an element found in 1 mole of a molecule.
- c) The position of an element on the periodic table.
- d) The number of neutrons found in the nucleus of an atom.

14. From its atomic number of 15, it is possible to predict that a phosphorus atom has:

- a) 15 neutrons.
- b) 15 protons.
- c) 15 electrons.
- d) Only b & c are correct.

15. A 2% solution would contain:

- a) 2 g of solute in 100 ml.
- b) 0.2 g solute in 10 ml.
- c) a and b.
- d) None of the above.

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16. When coal is burned, it releases carbon dioxide into the atmosphere. Which other gas is released in large amounts?

- a) Helium.
- b) Argon.
- c) Sulphur dioxide.
- d) Ozone.

17. Which acid is primarily responsible for acid rain?

- a) Hydrochloric acid.
- b) Hydrofluoric acid.
- c) Sulphuric acid.
- d) Acetic acid.

18. One microgram can be written as:

- a) 1 mg.
- b) 1  $\mu\text{g}$ .
- c) a and b.
- d) None of the above.

19. Aquatic microalgae are good candidate organisms for producing biofuels because:

- a) They produce lipid as a part of their cellular metabolism.
- b) They produce ethanol as part of their cellular metabolism.
- c) They produce by-products that are useful in agriculture.
- d) a and c are correct.

20. What is the pH of a solution with a hydrogen ion concentration  $[\text{H}^+]$  of  $10^{-6}$  M?

- a) 2.
- b) 4.
- c) 6.
- d) 8.

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21. When NaCl is dissolved in water, the NaCl is the \_\_\_\_\_ and the water is the \_\_\_\_\_ .

- a) Solvent; solution.
- b) Solute; solvent.
- c) Solute; solution.
- d) Solvent; solute.

22. How many electrons would be expected in the outermost shell of the atom neon?

- a) 1.
- b) 7.
- c) 8.
- d) 6.

23. The linkage which joins two amino acid units is called a/an:

- a) Peptide bond
- b) Hydrophobic interaction
- c) Ionic bond
- d) Hydrogen bond

24. A protein can be unfolded by a process called:

- a) Renaturation.
- b) Denaturation.
- c) Oxidation.
- d) Reduction.

25. Which of the following is considered as the 21<sup>st</sup> amino acid?

- a) Hydroxylysine.
- b) Ornithine.
- c) Citrulline.
- d) Selenocysteine.

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26. Which of the following statements about enzymes or their function is true?

- a) Enzymes do not alter the overall change in free energy for a reaction
- b) Enzymes are proteins whose three-dimensional form is key to their function
- c) Enzymes speed up reactions by lowering activation energy
- d) All of the above

27. In what form is glucose stored in animal muscles and liver cells?

- a) Glucagon
- b) Vitamins
- c) Glycogen
- d) None of these

28. Energy is released when:

- a) A phosphate group is added to a molecule of ATP.
- b) A phosphate group is released from a molecule of ATP.
- c) A phosphate group is either added or released from a molecule of ATP.
- d) A nitrate group is released from a molecule of ATP.

29. Starch is an example of?

- a) Monosaccharides
- b) Oligosaccharides
- c) Polysaccharides
- d) Lipids

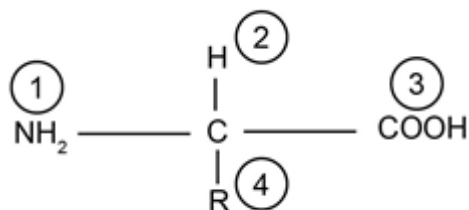
30. Which of the following is true:

- a) All exothermic reactions are spontaneous.
- b) All endothermic reactions are spontaneous.
- c) Some exothermic reactions are spontaneous.
- d) No exothermic reactions are spontaneous.

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31. An amino acid has the following structure:



Which two of the groups, 1-4, combine to form a peptide link?

- a) 1 and 2.
- b) 1 and 3.
- c) 2 and 3.
- d) 3 and 4.

32. How many fatty acid chains are found in a phospholipid?

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

33. With respect to proteins, the primary structure refers to the:

- a) Helix or pleated sheet pattern of a polypeptide
- b) Complex 3-dimensional folding pattern of a polypeptide
- c) Interaction of more than one polypeptide chain
- d) Ordered sequence of amino acids in a polypeptide

34. The main difference between an acid and a base is that:

- a) Bases are polar molecules and acids are not.
- b) Acids are polar molecules and bases are not.
- c) Bases donate hydrogen ions in water while acids accept hydrogen ions.
- d) Acids donate hydrogen ions in water while bases accept hydrogen ions.

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35. Which of the following statements is NOT correct about the phospholipid molecules in the plasma membrane?

- a) Each phospholipid molecule has three nonpolar tails.
- b) Each phospholipid molecule has one polar head.
- c) The phospholipid tails are not attracted to water.
- d) The phospholipid heads face outward.

36. An element that has been oxidized:

- a) Increases its oxidation number.
- b) Decreases its oxidation number.
- c) Has an oxidation number of zero.
- d) Has a positive oxidation number.

37. Which of the following is NOT a recognized acid-base theory?

- a) Arrhenius acid-base theory.
- b) Bronsted-Lowry acid-base concept.
- c) Williams acid-base concept.
- d) Lewis acid-base concept.

38. The technique for purification of proteins that can be made specific for a given protein is:

- a) Gel filtration chromatography.
- b) Ion exchange chromatography.
- c) Electrophoresis.
- d) Affinity chromatography.

39. Which of the following is not a factor responsible for denaturation of proteins?

- a) pH change
- b) Organic solvents
- c) Heat
- d) Charge

40. At a pH below the isoelectric point, an amino acid exists as:

- a) Proteom.
- b) Anion.
- c) Zwitterion.
- d) Undissociated molecule.

[Total for Section A: 40 marks]

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**SECTION B: Answer ALL questions in this section; 60 marks in total.**

1. Describe how surfactants (dispersant) chemicals work when treating oil spills. (6 marks)
2. Accuracy and precision are important considerations for any laboratory procedure.  
What do these terms mean and how do they differ? (5 marks)
3. Define the terms 'risk' and 'hazard' in the context of a laboratory risk assessment. (4 marks)
4. What is the importance of the -R group in an amino acid molecule? (5 marks)
5. What is the difference between monosaccharides and disaccharides? What are some examples of them? (5 marks)
6. Explain the factors which affect enzyme activity. (10 marks)
7. How are lipids classified according to solubility? (5 marks)

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8. What are the main theoretical models that try to explain the formation of the enzyme-substrate complex?

(10 marks)

9. What is the activation centre of an enzyme? Is it the key or the lock in the 'lock and key' model?

(5 marks)

10. Describe the functional classification of proteins.

(5 marks)

**[Total for Section B: 60 marks]**

**END OF QUESTIONS**