THE UNIVERSITY OF THE WEST INDIES

EXAMINATIONS OF: Summer – 2014/2015

CODE AND NAME OF COURSE: FOUN 1210 – Science, Medicine and Technology in Society

DATE AND TIME: DURATION: 3 Hours

INSTRUCTIONS TO CANDIDATES:

This paper has 12 Pages and 58 Questions.

This examination consists of three Sections: Part A Multiple Choice Questions, and Parts B and C, Essay Questions.

Answer ALL questions in Part A in the Multiple Choice answer section of the examination booklet.

Answer ONE (1) question from Section B AND ONE (1) question from section C.

Section A is worth FIFTY (50) marks and each question in Sections B and C has a value of TWENTY FIVE (25) marks.
SECTION A

1. Which of the following presents a major problem in tracking Bovine Spongiform Encephalopathy?
   a. The causal agent is unknown.
   b. Many years elapse between exposure and the development of symptoms.
   c. Cattle do not display any symptoms.
   d. Countries do not share information.

2. Galileo Galilei's work was experimental because he
   a. had an hypothesis.
   b. made predictions.
   c. constructed artificial environments to minimize or ignore some variables.
   d. interrupted the flow of nature.

3. William Harvey's approach is said to be innovative and experimental because he
   a. interrupted the normal flow of nature in living organisms to observe the results.
   b. used instruments.
   c. used mathematics.
   d. speculated on reality by using existing theories.

4. How is modern genetic engineering different from older methods in biotechnology?
   a. It operates at the molecular level.
   b. It operates at the cellular level.
   c. It operates at the level of the whole organism.
   d. It is safer.

5. Genes are found within the nuclei of cells and
   a. are a set of genetic instructions which define the characteristics of an organism.
   b. are the precursors of vitamins.
   c. are NOT found in gametes.
   d. separate from chromosomes during cell division.
6. In genetic engineering, what do geneticists use to cut long strands of DNA into shorter pieces?
   a. Sulphuric acid
   b. Fine-beam lasers
   c. Micro-scalpels
   d. Enzymes

7. Meiosis
   a. reduces the number of chromosomes by half.
   b. produces identical copies of cells.
   c. occurs in every cell.
   d. only occurs in females.

8. *Escherichia coli* that are modified with human genes are called
   a. stem cells.
   b. retroviruses.
   c. transgenic organisms.
   d. cloning.

9. When an antigen invades the body, protection is provided by the immune system when
   a. red blood cells produce antibodies.
   b. all white cells attack the foreign substance.
   c. B cells produce antibodies.
   d. thrombocytes clot around the foreign body.

10. Which of the following is NOT true of petroleum based fuels?
    a. They are currently more accessible than alternative sources of energy.
    b. Their energy originated with the sun.
    c. They are renewable.
    d. They are distilled from Crude Oil.
11. The key objective of the Kyoto protocol is to

   a. limit the emission of gases that produce acid rain.
   b. balance the level of carbon dioxide released naturally with that consumed naturally.
   c. establish global strategies for limiting the emission of chlorofluorocarbons.
   d. establish global strategies for limiting the emission of greenhouse gases.

12. Which of the following is NOT a greenhouse gas?

   a. Nitrogen
   b. Methane
   c. Carbon Dioxide
   d. Nitrous Oxide

13. There is evidence that the average temperature of the world is increasing slowly. This statement is:

   a. True during the summer and false during the winter.
   b. Being debated.
   c. False.
   d. True.

14. Evidence suggests that greenhouse gases are directly responsible for

   a. an increase in UV radiation entering the atmosphere.
   b. an increase in the average global temperature.
   c. a decrease in the average global temperature.
   d. destruction of the ozone layer.

15. The process of arriving at a specific scientific conclusion through simple rules of logic that start with a general premise is known as

   a. paradigm shifts.
   b. induction.
   c. hypothetico-deduction.
   d. deduction.
16. The occurrence of paradigm shifts suggests that the scientific method is NOT
   a. completely honest.
   b. completely objective.
   c. very careful.
   d. productive.

17. Which of the following conditions must the inductive process fulfill in order for a general scientific law to be legitimate?

   I. The number of observations leading to the generalization must be large.
   II. The observations must be repeated under a wide variety of conditions.
   III. The syllogism must be valid.
   IV. The major premise must be sound.
   V. No observation should conflict with the derived universal law.

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

18. Scientists who practice NORMAL science

   a. always function within the established paradigm.
   b. are able to control all of the possible environmental variables.
   c. do not subscribe to the normal set of fundamental assumptions.
   d. are often NOT immediately embraced by the scientific community.

19. A shift from one set of fundamental assumptions to another set of fundamental assumptions is called

   a. falsification.
   b. theory-ladeness.
   c. hypothesis formulation.
   d. a paradigm shift.
20. A scientist who follows the W is aware of a problem and goes about solving it by first researching and formulating a new hypothesis. She then does X which require careful Y and data collection. Finally she Z and comes to conclusions. Which order of steps below is correct for what W, X, Y and Z represent?

   a. W = inductive method; X = experiments; Y = analysis; Z = makes observations
   b. W = deductive method; X = data analysis; Y = experimentation; Z = makes observations
   c. W = hypothetico-deductive approach; X = experiments; Y = observation; Z = analyses the data
   d. W = a paradigm; X = data analysis; Y = induction; Z = experiments

21. In science, facts are based on evidence but are always

   a. mere guesses.
   b. theory-laden.
   c. unchanging laws.
   d. changing arbitrarily.

22. Litmus paper is used to

   a. test the acidity and alkalinity of liquids.
   b. test for lithium.
   c. check for the truth value of a theory.
   d. determine the presence of lipids.

23. The theory of evolution was explained in Charles Darwin’s book published in 1859 and titled

   a. Evolution versus Creationism.
   b. The Origin of Species.
   c. The Origin of Man.
   d. The Origin of the Big Bang.

24. Darwin’s theory of evolution states that

   a. humans descended from monkeys.
   b. humans and primates have a common ancestor.
   c. we should be able to see monkeys becoming human during our life time.
   d. the universe started with a Big Bang.
25. The knowledge that oxygen is responsible for the reactions referred to as combustion and its subsequent displacing of phlogiston theory is an example of
   a. normal science.
   b. a paradigm shift.
   c. incompetent scientists.
   d. inductive progress.

26. The smallest units of compounds are
   a. enzymes.
   b. molecules.
   c. hydrogen and oxygen.
   d. atoms.

27. Diamond is hard and expensive while coal is soft and cheap yet they are both
   a. easily dissolved in a solution of acid.
   b. easily manufactured.
   c. found in volcanoes.
   d. made of carbon atoms in different configurations.

28. Individual cells were first seen in 1655 by
   a. Albert Einstein.
   b. Thomas Kuhn.
   c. Robert Hooke.
   d. Antoine Lavoisier.

29. Atoms form bonds using their
   a. outer shells.
   b. protons.
   c. nuclei.
   d. neutrons.

30. Which of the following diseases is transmitted by a vector?
   a. Lou Gehrig’s disease
   b. Dengue
   c. Skin cancer
   d. Leukaemia
31. Which of the following statements is correct?

   a. Antibiotics will cure bacterial infections but not viral infections.
   b. Antibiotics will cure viral infections but not bacterial infections.
   c. Antibiotics will cure all infections.
   d. Antibiotics are a form of placebo.

32. The internet grew out of a project originally sponsored by

   a. IBM.
   b. Microsoft.
   c. The United Nations.
   d. The US Department of Defense.

33. TCP/IP is the acronym for

   d. Type C Peripheral or Interconnection Point.

34. An algorithm is a

   a. series of unambiguous executable steps to perform a task in a finite amount of time.
   b. type of internet search engine.
   c. programming language.
   d. digital music channel.

35. E-commerce has the potential to “level the playing field” so that Caribbean countries can compete with larger more developed nations but they must first solve the problem(s) of:

   a. Access to the internet and finding ways to penetrate markets.
   b. The infrastructure of financial institutions to handle the e-commerce transactions.
   c. Intellectual Property rights.
   d. All of the above.
36. What is the central concept in computer science?
   a. The internet
   b. TCP/IP
   c. HTML
   d. The algorithm

37. Oil was discovered in Trinidad and Tobago in
   a. 1866.
   b. 1966.
   c. 1838.
   d. 1796.

38. Which hydrocarbon comes off at the top of a fractionating column?
   a. Tar
   b. Kerosene
   c. Methane
   d. Heating oil

39. What is removed at the bottom when the complex mixtures of hydrocarbons in crude oil are separated through fractional distillation?
   a. Pitch and tar
   b. Gas
   c. Gasoline
   d. Kerosene

40. Solar panels that produce hot water are made of
   a. silicon based panels.
   b. copper pipes and large sheets of metal painted black.
   c. heat-producing, spinning generators.
   d. chemical catalysts activated by sunlight.

41. Normal blood sugar levels range between:
   a. 50 and 60 milligrams per decilitre.
   b. 90 and 210 milligrams per decilitre.
   c. 70 and 110 milligrams per decilitre.
   d. 10 and 50 milligrams per decilitre.
42. The normal figures for blood pressure range between
   a. 120/80 mmHg and 130/85 mmHg
   b. 80/20 mmHg and 100/60 mmHg
   c. 160/120 mmHg and 200/150 mmHg
   d. 80/120 mmHg and 100/130 mmHg

43. In gender theory, sex and gender are determined by
   a. genetics alone.
   b. socialization and biology respectively.
   c. parental lifestyles alone.
   d. biology and socialization respectively.

44. The prevalence of women in science has historically been hindered by
   a. their lack of interest in scientific discovery.
   b. the natural ability of men to more easily master scientific concepts.
   c. the fact that women are not good at mathematics.
   d. personal, structural and institutional bias.

45. The number of people contracting any disease within a given period in a population is measured by its
   a. virulence.
   b. incubation period.
   c. incidence.
   d. prevalence.

46. What is the name of the chromosome which determines that a human will be male?
   a. Y chromosome
   b. XY genotype
   c. AB blood type
   d. X chromosome
47. The dominant alleles of chromosome 4 bears the mutation responsible for
   a. Huntington's disease
   b. Cystic Fibrosis
   c. Sickle Cell Anaemia
   d. Down's Syndrome

48. The price of crude oil is controlled largely by
   a. OPEC.
   b. The USA.
   c. The United Nations.
   d. China.

49. Who or what are Hiroshima and Nagasaki?
   a. Japanese scientists who won the Nobel Prize.
   b. Japanese cities destroyed by atomic bombs.
   c. Japanese cities that generate energy using nuclear power plants.
   d. Genetically modified viruses produced in Japan.

50. At fertilization, male and female gametes fuse to produce first
   a. a chromosome.
   b. a foetus.
   c. an embryo.
   d. a zygote.

END OF SECTION A
SECTION B

Answer ONE (1) question ONLY. Each question is worth twenty five (25) marks.

B.1. Describe “mad cow” and “foot and mouth” disease and discuss why they are of concern to the Caribbean.

B.2. Review the strengths and weaknesses of induction, deduction and the hypothetico-deductive method and explain their role in the progress of science.

B.3. Explain the difference between science, medicine and technology and discuss their interplay.

B.4. Write an essay entitled “Gender and science.”

END OF SECTION B

SECTION C

Answer ONE (1) question ONLY. Each question is worth twenty five (25) marks.

C.1. What are the benefits of modern biotechnology?

C.2. How does inheritance work? Discuss three diseases that can occur when the mechanism of inheritance goes wrong.

C.3. Select two major industries in the Caribbean and discuss their energy consumption and production while noting any social and economic impacts and the role of OPEC.

C.4. Write an essay exploring the ethical issues that arise within Information and Communications Technology and Biotechnology.

END OF PAPER