1 The scientific article you have studied is adapted from articles in *Nature* and *Scientific American*.

Use the information from the article and your own knowledge to answer the following questions.

(a) Rabies is a 'nasty infection' caused by a virus (paragraph 5).
Explain how scientists would be able to determine that the rabies pathogen is a virus.

(2)

.....

.....

.....

.....

.....

*(b) Suggest how researchers had genetically modified the pathogen to 'provoke an effective immune response' (paragraph 12).

(6)

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

PhysicsAndMathsTutor.com

(c) Octopamine is a neurotransmitter (paragraph 24). Libersat and his team believe that wasp venom probably blocks octopamine receptors in the central nervous system of the cockroach.

Suggest **two** ways that the 'compound that reactivates octopamine receptors' (paragraph 25) could work.

(2)

.....

.....

.....

.....

.....

.....

.....

.....

(d) Suggest how scientists, such as Hughes, could have estimated that ants comprise 'half of all insect biomass worldwide' (paragraph 31).

(3)

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

PhysicsAndMathsTutor.com

(e) 'While the manipulated individual may look like an ant, it represents a fungal genome expressing fungal behaviour through the body of an ant' (paragraph 33).

Suggest how fungal genes may be expressed and affect the behaviour of these ants.

(5)

PhysicsAndMathsTutor.com

(f) Suggest what is meant by the term **clock genes** (paragraph 35).

(2)

.....

.....

.....

.....

.....

.....

.....

.....

(g) Suggest how a lack of 'signals' (paragraph 36) could lead to muscle atrophy.

(4)

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

PhysicsAndMathsTutor.com

(h) 'Instead of one variable species' (paragraph 44), Evans, Hughes and Elliot have identified four new species of the fungus.

Suggest how these could have been identified as separate species.

(4)

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

(i) There is evidence showing that ants parasitised by the fungus bite the main veins of leaves (paragraphs 35 and 47).

Suggest the advantages to the zombie fungus of this ant behaviour.

(2)

.....

.....

.....

.....

.....

.....

(Total for Question 1 = 30 marks)

PhysicsAndMathsTutor.com

2 One gene can give rise to more than one protein.

(a) Give **three** differences between fibrous and globular proteins.

(3)

.....

.....

.....

.....

.....

.....

.....

.....

.....

PhysicsAndMathsTutor.com

*(b) Sex determination in *Drosophila* (fruit fly) is controlled by the *Sxl* gene that codes for the Sxl protein. The *Sxl* gene is the same in female and male *Drosophila*.

The length of the protein in the female *Drosophila* is different from the length of the protein in the male *Drosophila*.

Suggest how the same *Sxl* gene can give rise to these different proteins.

(6)

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

(Total for Question 2 = 9 marks)

PhysicsAndMathsTutor.com