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**6 BIO5/01 June 2014  
Support Questions and  
materials for use with  
question 7 pre-released  
scientific article.**

**The immortal life of Henrietta  
Lacks.**

**Task 1: You are to look up every word listed below and write its definition in the space provided. There is room for you to add more words if you wish.**

Glossary term	paragraph	Your definition
Cervix	2	
Trillion	4	
(polio) vaccine	4	
chemotherapy	4	
cloning	4	
Gene mapping	4	
In vitro fertilisation	4	
Cell reproduction cycle	6	
Chain reaction of protein activations	6	
mitosis	7	
Kinase inhibitor	7	
Tissue	9	
Organ	9	
enzyme	10	
nucleus	10	
genome	10	
embryo	11	
cancer	12	
tumour	14	
gene	16	
herpes	16	
Leukaemia	16	
influenza	16	
haemophilia	16	
Parkinson's Disease	16	
lactose	16	
appendicitis	16	
chromosome	16	
epidemic	19	
inoculate	20	
immune	20	
Blood serum	20	
In suspension	24	
susceptible	25	
Gene expression	27	
hormone	27	
protein	27	
malignant	28	
ozone	30	
somatic	32	
cardiovascular	30	
Gene therapy	35	
Monoclonal antibodies	37	
Human papilloma virus	41	
biopsy	41	

Tumour suppressor gene	43	
Gene mutation	47	
Designer babies	47	
Hayflick limit	58	
Telomere	60	
<b>English lesson</b>		
Inconceivable	5	
gnomish	6	
schematics	6	
freshman	7	
choreographed	11	
Longevity	16	
optimal	27	
synthesising	27	
simulated	30	
dissemination	48	
Disassociate	56	
Epiphany	59	

Page number	Word	Meaning
2	MPF triggering a chain reaction of protein activation	
	Kinase inhibitors	
3	haemophilia	
	Human longevity	
4	Inoculate	
	Gey	
5	Polio tested	
	Malignant	
6	Precursor	
	Monoclonal antibodies	
	Herceptin	
	Centaur	
	PR problem	
7	Biopsy	
	virulent	
	virologist	
8	dissemination	

**TASK 2: This task will aid your understanding of the article further. The following terms and words are not strictly part of the A level specification, but you do need to understand them. Define them and write the definition in the space.**

**Task 3: Attempt the following calculations. Simple calculations will be featured in every paper.**

**Paragraph 5**

- 1) A typical human stem cell weighs just 1 nanogram. If all of Henrietta's cells did weigh 50 metric tonnes how many cells would that be? (1 metric tonne is 1000 kg)
- 2) A typical human cell is 50µm in width. If Henrietta's cells are estimated to span 350 million feet then how many cells are there by this estimate? (There are 304.8 mm in a foot).

**Task 4: Attempt the following questions using the AS and A2 textbooks for support.**

**Paragraph 10**

- 3) Draw a typical animal cell and label each part with its function (support in topic 3 on page 104 of AS textbook).
- 4) Define the terms diffusion, osmosis and active transport (support in topic 2 on page 69-72 of AS textbook).
- 5) For each of the following chemicals state how they move through the cell membrane (support in topic 2 on page 69-72 of AS textbook):
  - Water
  - Nutrients such as glucose
  - Oxygen
- 6) What role do the different molecules that make up the cell membrane have in 'pumping' water, nutrients and oxygen in and out of the cell? (Support in topic 2 on page 69-72 of AS textbook):
- 7) The article refers to 'little cytoplasmic factories' – identify the organelles in cells that would 'crank out' (i) fats (ii) proteins (iii) energy (support in topic 3 on page 104 of AS textbook).
- 8) What is the location of the cells that 'control the heart beat', and what is the correct name for the group of cells that perform this role? (Support in topic 7 on page 161-162 of A2 textbook).

**Paragraph 11**

- 9) List the stages of the cell cycle including mitosis and outline the cellular changes that take place at each stage. (Support in topic 3 on page 114-119 of AS textbook).

**Paragraph 12**

- 10) What genes that control mitosis are particularly dangerous if mutated (support in topic 3 on page 139-141 of AS textbook).

**Paragraph 16**

11) What drug treatments and surgery are available for patients with Parkinson's disease? Explain how they work (support in topic 8 on page 250-251 of A2 textbook).

12) What gene is involved in the digestion of lactose in prokaryotes? (Support in topic 3 on page 128-129 of AS textbook).

13) Draw and label a chromosome (support in topic 3 on page 115 of AS textbook).

**Paragraph 20**

14) What would a blood test for Polio immunity look for the presence of? (Support in topic 6 on page 124-125 of A2 textbook).

15) In paragraph 20 it refers to children becoming immune to polio. Describe the role of B and T cells in developing immunity to the polio virus. (Support in topic 6 on page 100-105 of A2 textbook).

**Paragraph 21**

16) Outline the ethical viewpoints about using animals in medical research. (Support in topic 8 on page 248-249 of A2 textbook).

17) At what stage in drug development are animals used? At what stage in drug development are animals used? (Support in topic 4 on pages 186 of AS textbook).

**Paragraph 27**

18) Outline the entire process of protein synthesis from a gene to a protein with a tertiary structure. (Support in topic 2 on pages 62-64 and 81-85 of AS textbook).

19) Outline how cells communicate with one another (support in topic 3 on pages 130-131 of AS textbook).

20) Outline how energy is released from ATP. (Support in topic 7 on pages 145-146 of A2 textbook).

21) Outline how gene regulation is controlled in the eukaryotic cell. (Support in topic 7 on pages 18-191 of AS textbook).

22) Give three differences in structure between bacterial cells and viruses. (Support in topic 6 on pages 91-92 A2 textbook).

**Paragraph 28**

23) With reference to the HIV virus explain how viruses 'inject bits of their genetic material and re-programme the cell to reproduce the viruses. (Support in topic 6 on pages 114-121 of A2 textbook).

**Paragraph 30**

24) How might radiation effect human cells? (Support in topic 3 on pages 141 of AS textbook).

**Paragraph 31**

25) Suggest which stages in the cell cycle are shortened in HeLa cells after visits into space. (Support in topic 3 on page 114-119 of AS textbook).

**Paragraph 32**

26) What events would take place in a normal fertilisation i.e. between a sperm and egg that would not occur in a somatic cell fusion? (Support in topic 3 on page 106-107 of AS textbook).

27) If a male which is homozygous for the normal CFTR gene mates with a female who is a carrier for the CF CFTR gene what is the probability that their child will be a carrier of the condition? (Support in topic 2 on page 90-92 of AS textbook).

**Paragraph 35**

28) Gene therapy that involves turning disease genes off would be effective in treating diseases that are caused by a dominant allele. Explain why this should be so. (Support in topic 2 on page 94-95 of AS textbook and topic 7 pages 190-191 in A2 textbook).

**Paragraph 36**

29) Explain how researchers were able to use hybrid HeLa/mouse cells to identify which human chromosomes carry specific genes.

**Paragraph 41**

30) Outline the role of T Killer cells in destroying cells infected with viruses. (Support in topic 6 on page 104-105 of A2 textbook).

**Paragraph 42**

30) Describe what a vaccine is comprised of and define the term 'herd immunity'. (Support in topic 6 on page 125 of A2 textbook).

**Paragraph 47**

31) Explain what you understand by the term 'designer baby'. (Support online and in topic 2 on pages 98 of AS textbook).

32) Making decisions about what is right and what is wrong. Outline the SNAB A level ethical frame works. (Support in topic 2 on pages 98-99 of AS textbook).

**Paragraph 53**

33) It has been suggested that HeLa cells have evolved to become a distinct species. Explain how a biological species can be defined, and why would be difficult to use this definition as a test to decide if HeLa cells really are a distinct species. (Support in topic 4 on pages 144-145 of AS textbook).

34) Outline the steps involved in evolution by natural selection (support in topic 4 on pages 151-153 of AS textbook).

**Paragraph 54**

35) Outline the binomial system for the naming of species. (Support in topic 4 on pages 157 of AS textbook).

36) Outline Woese's classification of the three domains of life using molecular evidence. (Support in topic 4 on pages 159-163 of AS textbook).

**Paragraph 56**

37) If it was possible to extract a small sample of DNA from Henrietta's body describe how this DNA could be amplified to produce sufficient DNA for a test. (Support in topic 6 on pages 76-77 of A2 textbook).

38) In a DNA test to determine genetic identity only small highly variable sections of DNA are sequenced. Describe these highly variable sections and why they are more likely to show differences than a gene for a key respiratory enzyme such as cytochrome oxidase. (Support in topic 6 on pages 73-74 of A2 textbook).

39) Describe the procedure that allows DNA sections to be separated to produce a genetic profile. (Support in topic 6 on pages 78-79 of A2 textbook).

40) If DNA from Henrietta and DNA from HeLa cells were run side by side in gel electrophoresis what would have to be observed for it to be determined if they were genetically identical. (Support in topic 6 on pages 80-81 of A2 textbook).

**Paragraph 60**

41) The relation between telomere length and age of a person is described as a correlation. Explain the difference between a correlation and a causal relationship. (Support in topic 1 on pages 20 of AS textbook).

**Task 2 answers**

Page number	Word	Meaning
2	MPF triggering a chain reaction of protein activation	Maturation promoting factor-drive the mitotic and meiotic cell cycle in eukaryotic organisms. It is a type of kinase protein
	Kinase inhibitors	Type of enzyme inhibitor that blocks the action of one or more protein kinase. Kinase – protein enzyme that adds phosphate group (e.g. from ATP) to a protein in organic molecule
3	haemophilia	Diseases that affects ability of blood to clot. Causes the sufferer the bleed even with minor injuries
	Human longevity	Long life of individual
4	Inoculate	To treat with a vaccine to produce immunity against disease
	Gey	Surname of cell biologist
5	Polio tested	Tested for polio – Polio infectious viral disease that affects CNS. Can cause temporary or permanent paralysis
	Malignant	Very virulent, harmful “malignant tumour” Cancerous cells that grow out of control and can spread to other areas in the body  “benign tumour”: Mass of cells that lacks ability to invade neighbouring tissues
6	Precursor	Substance from which another usually more active or mature substance is formed
	Monoclonal antibodies	Produced by single cloned cells or cell line and consists of identical antibodies
	Herceptin	Monoclonal antibody that interferes with the HER 2 receptor (growth factor) and used to treat breast cancer
	Centaurs	Mythical creature –half human/horse
	PR problem	Public relation problem
7	Biopsy	Examination of tissue removed from a living body to discover presence of cause of disease
	virulent	Extremely severe or harmful in its effect
	virologist	Person who studies viruses
8	dissemination	Act of dispersing something- spreading information

**Task 3 answers:**

1) 1 tonne = 1000 kg

1000 kg is 1000,000 g

1000,000 g = 1000,000,000 mg

1000,000,000 mg = 1000,000,000,000  $\mu$ g

1000,000,000,000  $\mu$ g = 1000,000,000,000,000 ng so 1000,000,000,000,000 (a quadrillion) cells which is equal to the number of ants on earth!

2) 350,000,000 feet = 106680000000 mm

106680000000 mm = 106,680,000,000,000  $\mu$ m

If a cell is 50 $\mu$ m wide then 106,680,000,000,000  $\mu$ m divided by 50 = answer

2,133,600,000,000 (2 trillion, 133 billion, 600 million) = answer