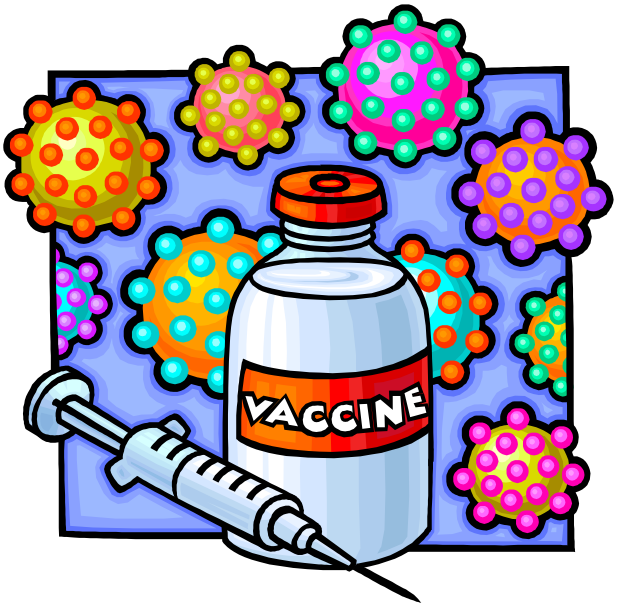
3AB HUMAN BIOLOGICAL SCIENCE

MANEA
SENIOR COLLEGE

Test 1:
Cell Processes, Biotechnology And Infection

Weighting 4%



Multiple Choice:	30 marks
Short Answer:	40 marks
Extended Answer:	15 marks
TOTAL	**85 MARKS**

Section A: Multiple Choice (30 Marks)

Answer all questions by placing and **X** through the most correct answer on the multiple choice answer sheet.

1. The fluid found between cells is known as:

(a) Intracellular fluid
(b) Extracellular fluid
(c) Lymph
(d) Intercellular fluid

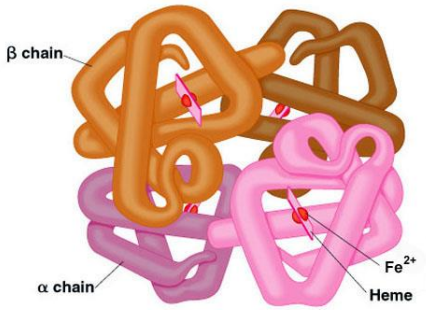
2. Facilitated diffusion

(a) requires the use of channel proteins
(b) requires the use of carrier proteins
(c) involves receptor proteins binding with the substance
(d) substances are soluble in the phospholipid membrane

3. Active transport occurs when substances move across membranes:

(a) from a region of lower concentration to a region of higher concentration.
(b) from a region of higher concentration to a region of lower concentration.
(c) by osmosis.
(d) by facilitated diffusion.

Refer to the following diagram of a haemoglobin molecule



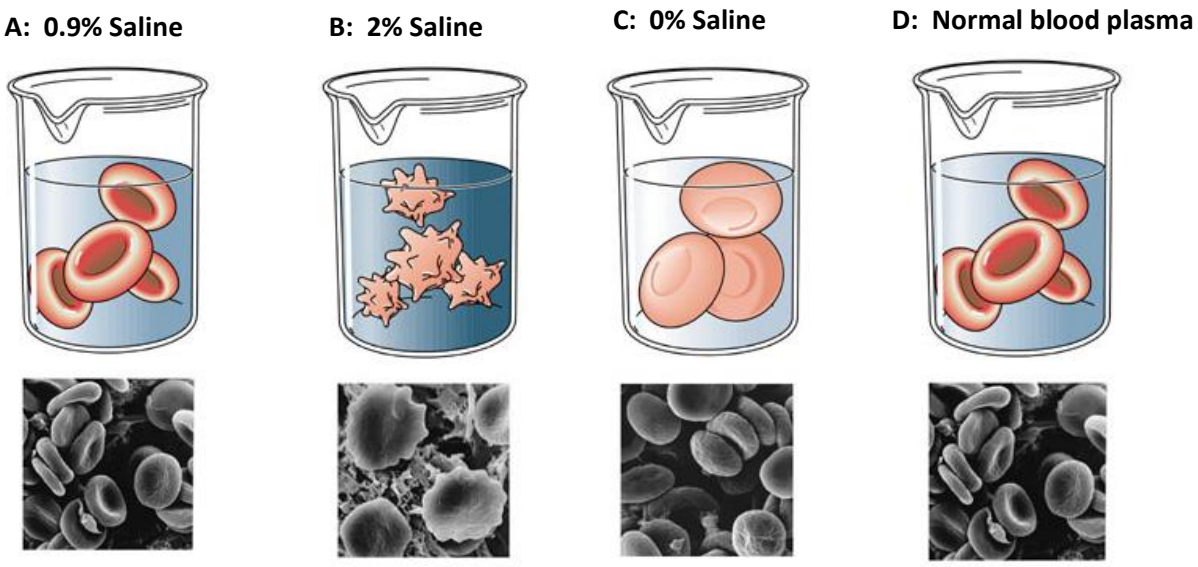
4. The above protein structure is known as

(a) Primary structure
(b) Secondary structure
(c) Tertiary structure
(d) Quaternary structure

5. The cells which secrete mucous into the stomach do so via

(a) Exocytosis
(b) Facilitated diffusion
(c) Active transport
(d) Pinocytosis

The next <u>three</u> questions refer to the following diagram



6. Some Red Blood cells were placed in three different saline solutions of 0.9%, 2%, 0%. A forth beaker shows cell in the body's normal plasma. Which of the above solutions can be said to have the same saline concentration as blood plasma?

(a) 0.9%
(b) 2%
(c) 0%
(d) More information is required

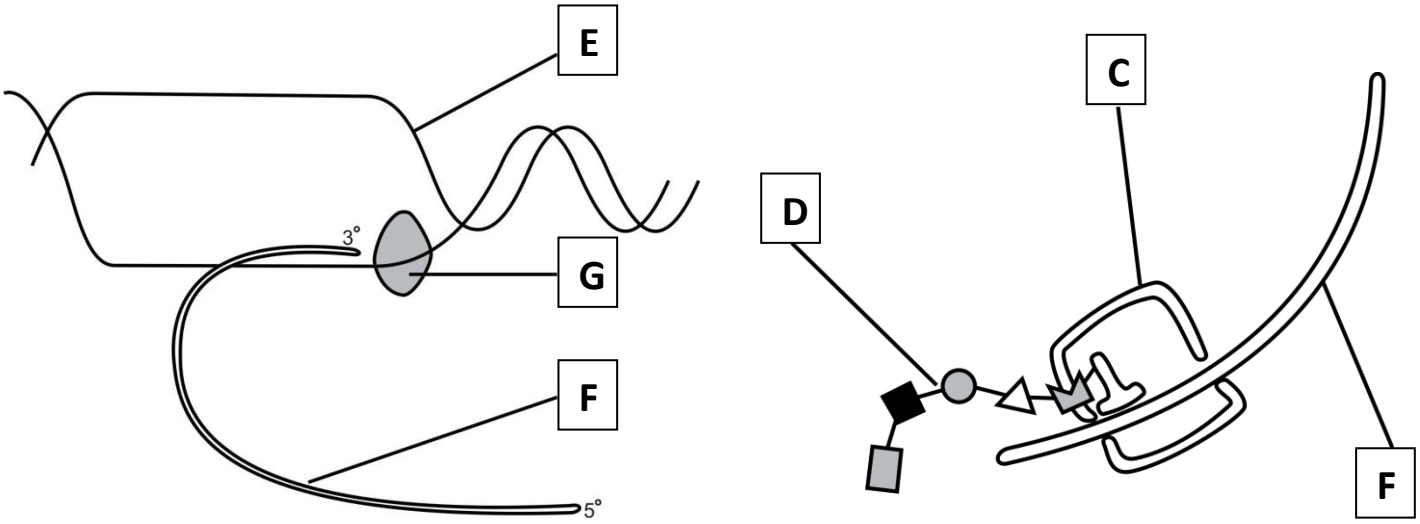
7. The cells in beaker C have swelled and the solution is said to be hypotonic. The cells in beaker C have swelled because:

(a) The ion content inside the beaker is higher than the ionic content of the blood cells.
(b) Water has moved into the blood cells due to a lower water concentration inside the cells
(c) Water has moved out of the cell and into the surrounding beaker
(d) Salt ions have moved into the cell due to a low concentration of salt ions in the beaker

8. The cells in beaker **D: Normal Plasma** are the

(a) Experimental group
(b) Control Group
(c) Independent variable
(d) Dependent variable

The next <u>three</u> questions refer to the following diagram that shows two parts of a process occurring inside a cell.



Stage A **Stage B**

9. Which of the following statements about the process, indicated in the diagrams above, is correct?

(a) Stage A is transcription as the mRNA is being converted to DNA.
(b) Stage B is translation and occurs inside the nucleus.
(c) Structure C is the ribosome where tRNA is formed.
(d) Structure D is the polypeptide chain formed from amino acids.

10. Structure E and structure F are different because structure F

(a) contains thyamine not uracil.
(b) is double stranded not single stranded.
(c) is constructed from deoxyribose sugars not ribose sugars.
(d) leaves the nucleus, unlike structure E.

11. Structure G

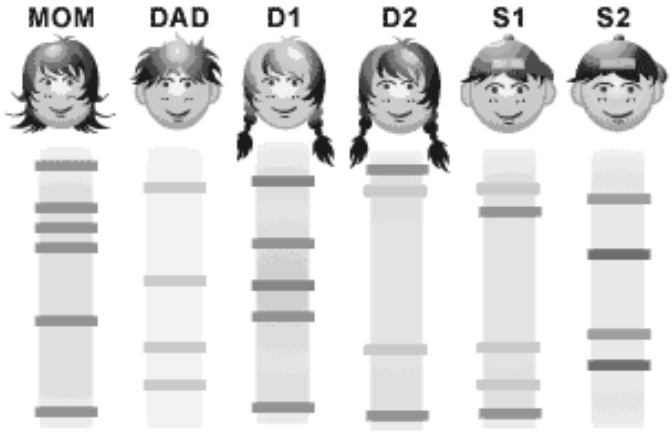
(a) is a DNA polymerase molecule.
(b) first binds to a promoter gene on the DNA.
(c) results in the modification of mRNA to only contain exons.
(d) uses nucleotides from the cytoplasm to form a mRNA chain.

12. In the polymerase chain reaction (PCR), DNA and the enzyme DNA polymerase are placed together in a solution that is repeatedly heated and cooled in cycles.

Which of the following is correct?

(a) Heating provides activation energy for the enzyme DNA polymerase.
(b) Cooling denatures the strands of the enzyme DNA polymerase.
(c) Cooling binds together the sugar and phosphate within the strands of DNA.
(d) Heating breaks the bonds between the bases in the strands of DNA.

Questions 13 and 14 refer to the following diagram



13. A DNA profile was constructed for the Smith family above. The Mother and Father have one daughter and one son together. They are

(a) D1 and S1
(b) D2 and S1
(c) D1 and S2
(d) D2 and S2

14. One daughter was from the mother's previous marriage and one son was adopted into the family. They are

(a) D1 and S1
(b) D2 and S1
(c) D1 and S2
(d) D2 and S2

15. Genetic probing is a technique used for identifying genes and alleles. It involves

(a) Multiplying segments of DNA
(b) Producing a banding pattern similar to barcodes
(c) Labelling genes with fluorescent markers
(d) Determining the sequence of bases in a segment of DNA

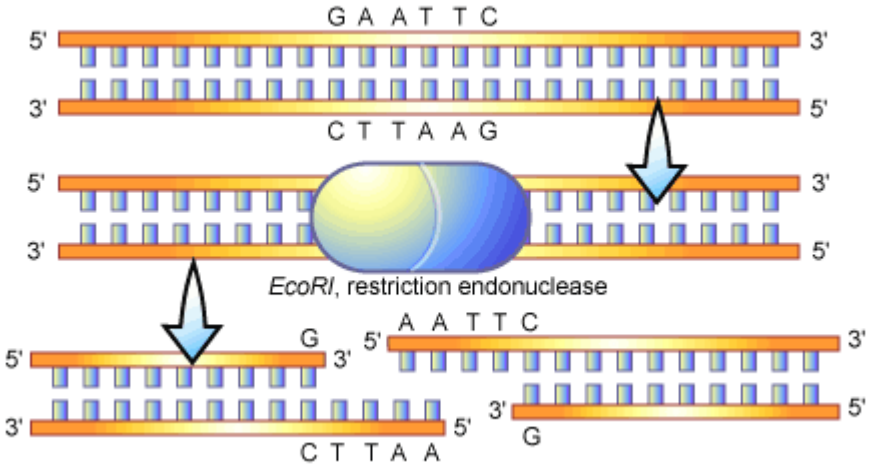
16. A phage is

(a) a bacterial cell containing plasmids
(b) a virus that infects a bacteria
(c) a segment of DNA that produces sticky ends
(d) an enzyme used to combine two segments of DNA

17. A nucleotide consists of

a. two complementary base pairs connected by a hydrogen bond
b. deoxynucleotides
c. three phosphate groups, deoxyribose sugar and a nitrogen base
d. a phosphate group and a sugar connected to two complementary base pairs

Refer to the following diagram



18. The restriction enzyme EcoR1 recognizes which base sequence to cut the stand of DNA?

(a) G A A T T C
(b) A A T T C
(c) C T T A A
(d) G A A T T C C T T A A G

19. Gene therapy

(a) involves replacing damaged or diseased cells with new ones cultured from stem cells
(b) can be used to treat polygeneic diseases
(c) enables faulty genes to be replaced with healthy ones in cystic fibrosis patients
(d) can only be used to treat the symptoms of a disease

20. DNA sequencing is useful as it demonstrates mutations caused by

(a) point mutations and deletions
(b) polyploidy
(c) somatic cells
(d) chromosome duplications

21. Synthetic nucleotides used in DNA sequencing are useful as they

(a) anneal primers to the DNA template
(b) denature the enzymes required to cut the DNA strand
(c) amplify the original DNA molecule
(d) stop the elongation of the DNA sequence

22. Tissue engineering requires

(a) non-biodegradable scaffolds which must be removed surgically
(b) tissue taken from the diseased organ
(c) that scaffolds cannot be devised from synthetic products
(d) scaffolds with high pore sizes for the diffusion of nutrients

23. T lymphocytes have been processes at some stage of their life by which gland?

(a) Testes
(b) Thyroid
(c) Thymus
(d) Tonsils

24. Which of the following CANNOT produce an active immunity to a disease?

(a) A dose of the disease
(b) Proteins in the colostrum.
(c) An injection of dead bacteria
(d) An injection of a weakened virus

25. Influenza vaccinations have to be repeated frequently because

(a) The influenza viruses have a longer life span than other viruses
(b) The antibodies produced in response to the vaccinations are not strong enough.
(c) Genetic changes in the viruses continually produce new strains
(d) The influenza viruses multiply at a very rapid rate.

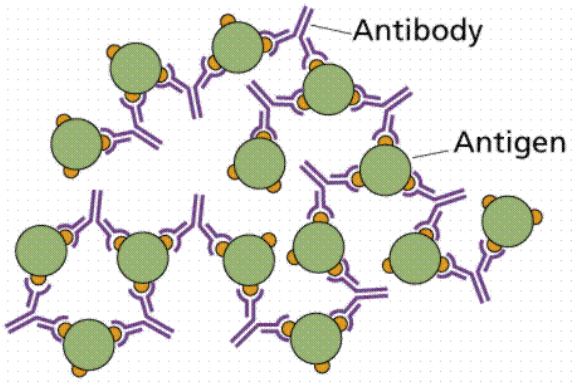
26. Which pair of statements in the table below best describes aspects of cell-mediated AND humoral immunity?

	Humoral Immunity	Cell-mediated immunity
(a)	Lymphocytes produced in bone marrow	Lymphocytes produced in the thyroid
(b)	Lymphocytes secrete antibodies	Plasma cells produce antibodies
(c)	Antigen is attacked by antibody	Antigen is attacked by killer cells
(d)	Attracts pathogens in lymphatic fluid	Destroys pathogens in bloodstream

27. When tonsillitis occurs, the tonsils become enlarged and painful. This happens because

(a) The lymph tissue in the tonsils is reacting to an infection
(b) The tonsils swell to keep infectious organisms from being swallowed.
(c) Extra red blood cells are being made to fight an infection.
(d) The spleen is unable to produce enough lymphocytes.

Question 28 refers to the following diagram



28. The diagram above shows

(a) lysis
(b) phagocytosis
(c) agglutination
(d) deamination

Questions29 and 30 refer to the following diagram

29. What process is occurring in the diagram above?

(a) Production of antibodies
(b) Phagocytosis
(c) Exocytosis
(d) Antibiotics

30. The cell responsible for this process is

(a) Lymphocyte
(b) Macrophage
(c) Leukocyte
(d) Killer T cells

END OF MULTIPLE CHOICE

MANEA SENIOR COLLEGE
3AB Human Biological Science

Test 1:
Cell Processes, Biotechnology And Infection

Weighting 4%

Multi Choice	
Short Ans	
Ext. Ans	
Total	

NAME:_____

TEACHER:_____

DATE:_____

Section A: Multiple choice (30 Marks)

Answer all questions by placing and X through the most correct answer on the multiple choice answer sheet.

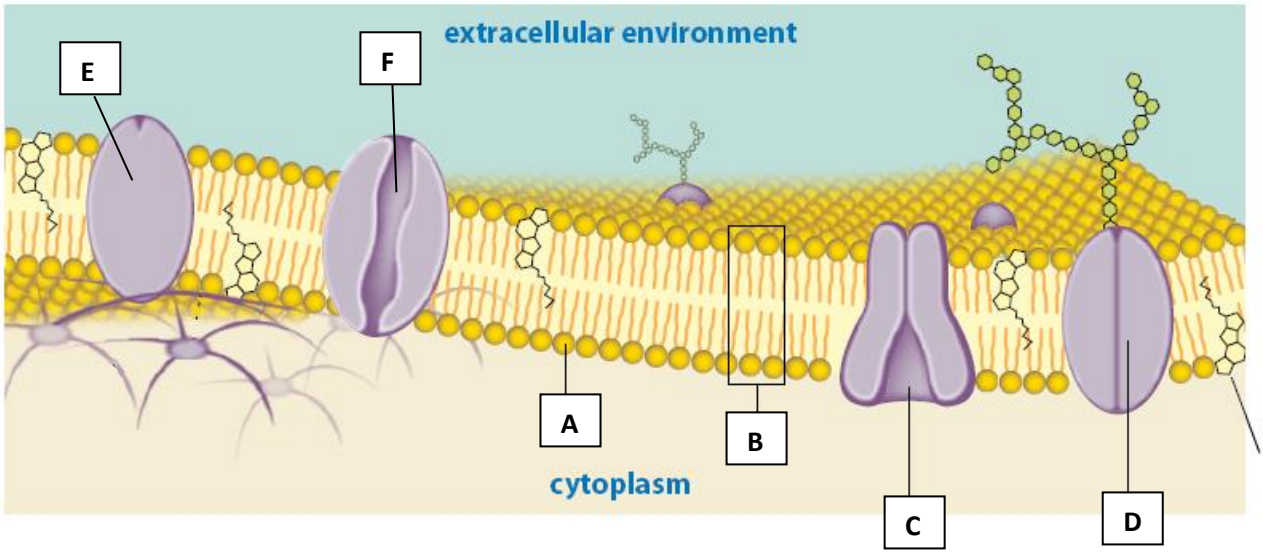
1.	a	b	c	d	16.	a	b	c	d
2.	a	b	c	d	17.	a	b	c	d
3.	a	b	c	d	18.	a	b	c	d
4.	a	b	c	d	19.	a	b	c	d
5.	a	b	c	d	20.	a	b	c	d
6.	a	b	c	d	21.	a	b	c	d
7.	a	b	c	d	22.	a	b	c	d
8.	a	b	c	d	23.	a	b	c	d
9.	a	b	c	d	24.	a	b	c	d
10.	a	b	c	d	25.	a	b	c	d
11.	a	b	c	d	26.	a	b	c	d
12.	a	b	c	d	27.	a	b	c	d
13.	a	b	c	d	28.	a	b	c	d
14.	a	b	c	d	29.	a	b	c	d
15.	a	b	c	d	30.	a	b	c	d

Section B Short Answer (40 Marks)

Answer all questions in the spaces provided.

Question 1 (9 marks)

Refer to the following diagram



(a) Label the following components of the cell membrane

A_____ B_____

D_____ F_____

(2 marks)

(b) Explain how structure C functions to enable substances to cross the cell membrane. Give an example of substance that it transports.

_____

_____

_____

_____

(3 marks)

(c) Hormones are specific and affect only target cells. Describe the role structure E plays in the interaction of the target cell and a hormone.

_____

_____

_____

(2 marks)

(d) Explain the role structure D plays in the immune response

_____

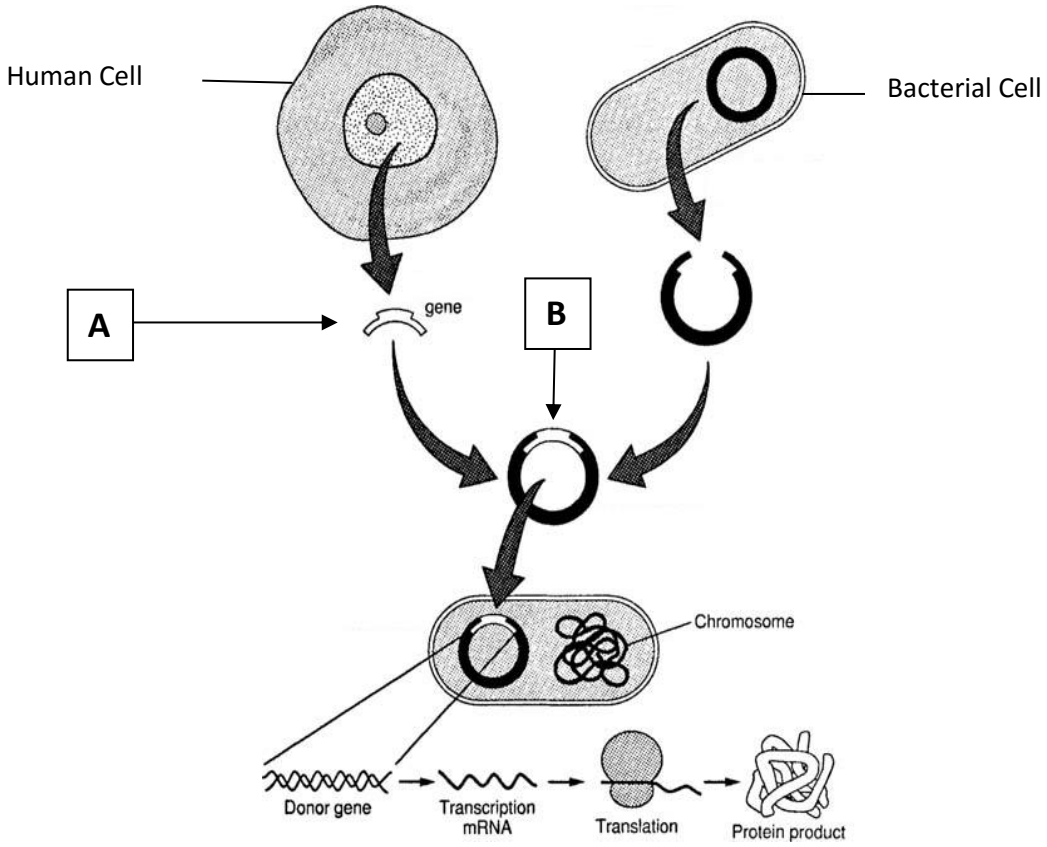
_____

_____

(2 marks)

Question 2 (11 marks)

Refer to the diagram below



(a) What process is represented by the diagram? (1 mark)

_____

(b) What type of vector is being used in this example? Explain why they are suitable for this technique. (2 marks)

_____

_____

_____

(c) What other types of vectors can be used? (1 mark)

_____

(d) Explain how the gene at position **A** has been isolated and removed from the donor DNA (1 mark)

_____

_____

(e) Name and describe the process that has occurred to produce **B** (3 marks)

(f) Name one way in which the above technique has improved modern medicine? (1 mark)

(g) The Polymerase Chain Reaction (PCR) is a widely used technique in molecular biology. What is the purpose of PCR? (1 mark)

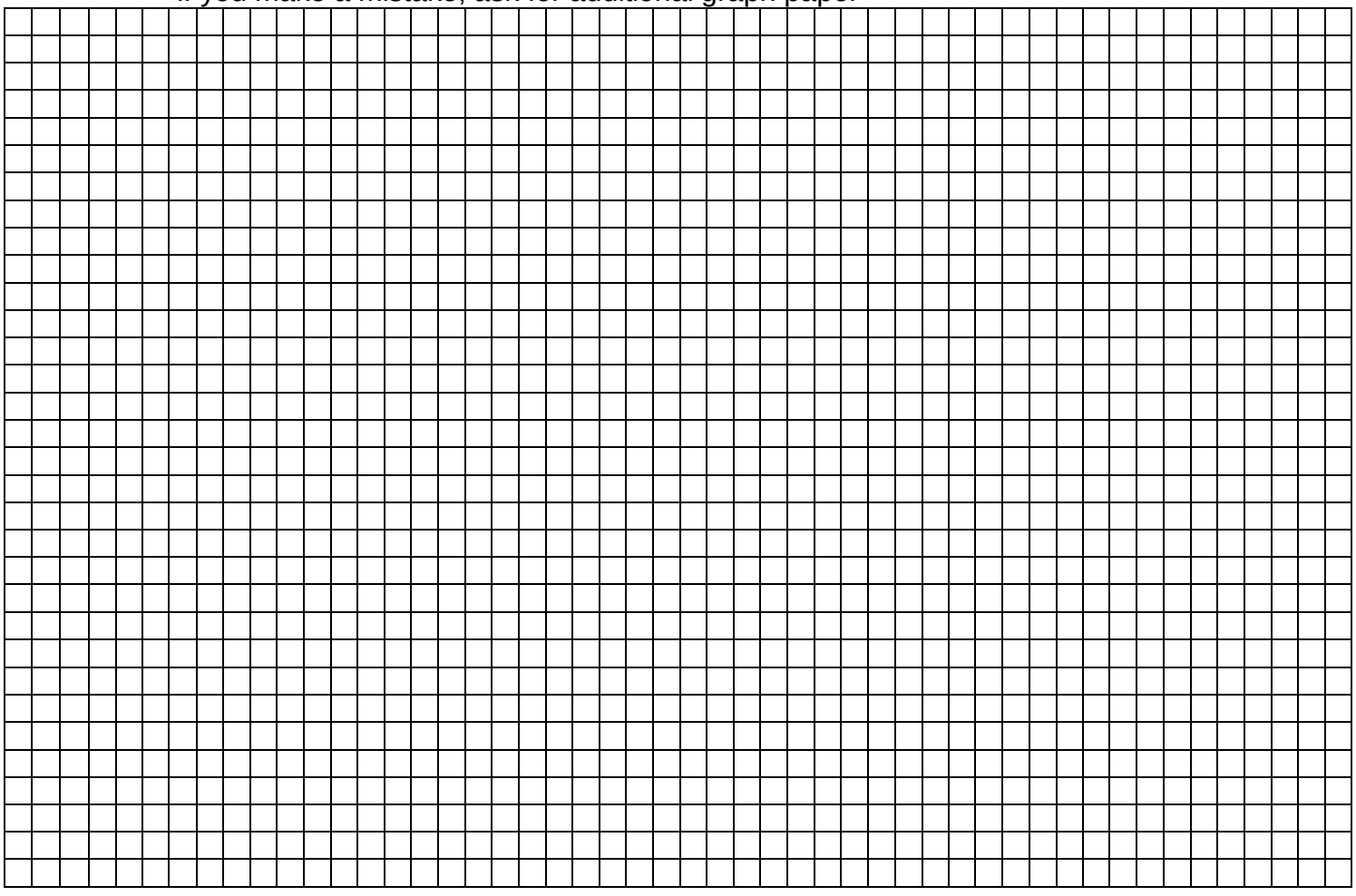
(h) Name a situation where PCR would be used. (1 mark)

Question 3 (20 marks)

In 2009 the viral infection "Swine Flu" that normally only infected pigs, mutated and crossed species infecting humans. This lead to a world wide epidemic and the race to produce a vaccine against the disease. In many laboratories around the world potential vaccines were investigated and trials performed to assess their effectiveness. The data recorded from one such trial are shown below.

Time (days)	**Vaccine by Injection** Antibody level of plasma	**Oral Vaccine** Antibody level of plasma
0	0	0
2	1	0
3	3	0
4	5	1
5	5.5	3
7	6	6
10	4	8
12	2	7
14	1.5	4
21	1	0.5
24	2	1
28	15	15
32	30	46
35	9	11
38	4	6
42	2	4

a) Graph the data recorded on the same graph, on the graph paper below **(5 marks)**
*If you make a mistake, ask for additional graph paper



b) For this experiment, identify the (2 marks)

(i) Independent variable _____

(ii) Dependent variable _____

c) Compare the primary responses shown by the two groups of subjects in the experiment (2 marks)

_____

_____

_____

d) On which day were the patients exposed for a second time to the antigen (1 mark)

_____

e) Explain clearly, why the secondary response is quicker and larger than the primary response. (3 marks)

_____

_____

_____

_____

f) Identify one method by which the vaccines used in the experiment could have been prepared. (1 mark)

_____

_____

g) Given that an antibody level of 10 is effective at combating the disease, which vaccine would be more successful at controlling the spread of this flu? Explain your answer (2 marks)

_____

_____

_____

h) Apart from antibody levels, what other blood measurement could be taken to assess the effectiveness of the secondary responses? (1 mark)

_____

_____

j) Identify **four** factors that would need to be controlled in the selection of subjects for this experiment (2 marks)

_____

_____

_____

k) What type of immunity would be gained from the swine flu vaccine (1 mark)

_____

END OF SECTION B

Section C Extended Answer (15 Marks)

Answer the following question in the space provided.

Up to **TWO MARKS** may be deducted for poorly structured answers: that is, answers in point form or diagrams not explained in the text of your answers. **DO NOT WRITE ANSWERS IN PENCIL**. Write your answers on lined pages with each question **CLEARLY LABELLED**.

(a) Proteins are a group of chemical substances that play a variety of important roles in the body. Proteins in the body are synthesised from amino acids obtained from the diet.

Explain the processes of transcription and translation that result in protein synthesis.

(9 marks)

(b) The cells control over when a particular protein is made and the quantity that is made is referred to as gene expression. Describe the roles of regulator, promoter and structural genes in gene expression.

(6 marks)