

Wednesday 21 May 2014 – Afternoon

AS GCE SCIENCE

G641/01 Remote Sensing and the Natural Environment

Candidates answer on the Question Paper.

OCR supplied materials:

None

Other materials required:

- Electronic calculator
- Ruler (cm/mm)

Duration: 1 hour




Candidate forename		Candidate surname	
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Centre number							Candidate number			
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INSTRUCTIONS TO CANDIDATES

- Write your name, centre number and candidate number in the boxes above. Please write clearly and in capital letters.
- Use black ink. HB pencil may be used for graphs and diagrams only.
- Answer **all** the questions.
- Read each question carefully. Make sure you know what you have to do before starting your answer.
- Write your answer to each question in the space provided. If additional space is required, you should use the lined page at the end of this booklet. The question number(s) must be clearly shown.
- Do **not** write in the bar codes.

INFORMATION FOR CANDIDATES

- The number of marks is given in brackets [] at the end of each question or part question.
- The total number of marks for this paper is **60**.
- You are advised to show all the steps in any calculations.
-  Where you see this icon you will be awarded marks for the quality of written communication in your answer.
This means, for example, you should:
 - ensure that text is legible and that spelling, punctuation and grammar are accurate so that meaning is clear;
 - organise information clearly and coherently, using specialist vocabulary when appropriate.
- You may use an electronic calculator.
- This document consists of **16** pages. Any blank pages are indicated.

AS SCIENCE RELATIONSHIPS SHEET

pressure = force \div area

energy transferred = mass \times specific heat capacity \times temperature rise

density = mass \div volume

wavenumber = 1 / wavelength

speed = frequency \times wavelength

energy = Planck constant \times frequency

current = charge \div time

power = voltage \times current

power loss = (current)² \times resistance

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Answer **all** the questions.

- 1 Scientists studied how the populations of organisms in a river varied with different levels of pollution.

Their data are shown in **Table 1.1**.

Higher populations of organisms are indicated by higher numbers.

River organism	Condition of river water				
	Very clean	Clean	Fairly clean	Dirty	Very dirty
Green algae	1	2	3	4	4
Trout	3	1	0	0	0
Water weeds	1	3	3	3	1

Table 1.1

- (a) Use the data in **Table 1.1** to describe the relationship between the population of green algae and the condition of the river water.

.....
..... [1]

- (b) Describe and explain the changes in the populations of the trout and the water weeds as the condition of the water changes.

Trout

.....
.....
.....
.....
..... [3]

Water weeds

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.....
.....
..... [3]

(c) Suggest a possible pollutant in this river.

..... [1]

(d) Rivers may also become polluted with detergent. Detergent destroys the plasma membrane of living cells.

Fig. 1.1 is a diagram of a plasma cell membrane.

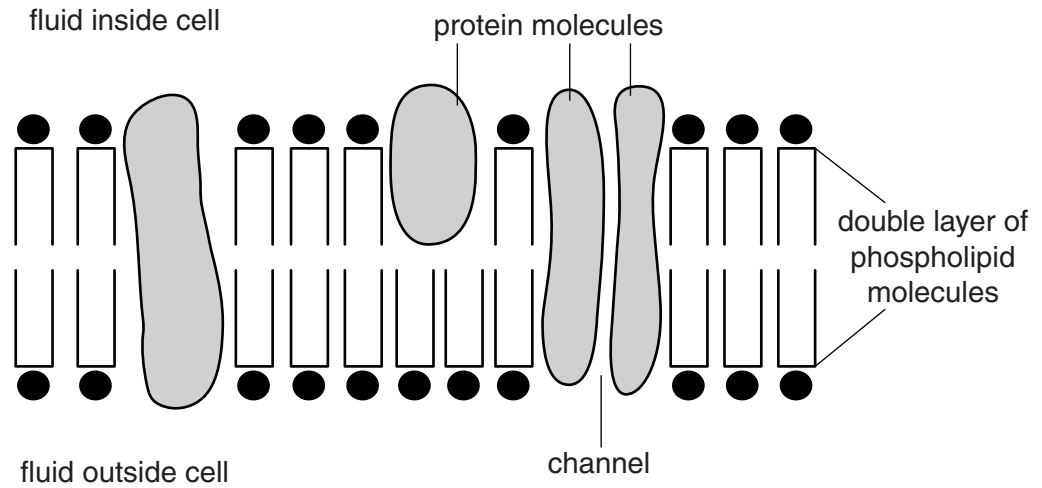


Fig. 1.1

Describe the role of the plasma cell membrane in a living cell and explain how the membrane carries out its functions.



In your answer, you should use appropriate technical terms, spelt correctly.

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..... [5]

[Total: 13]

- 2 **Fig. 2.1** shows the energy flow through an ecosystem. The numbers represent kilojoules of energy per square metre per year ($\text{kJm}^{-2}\text{yr}^{-1}$).

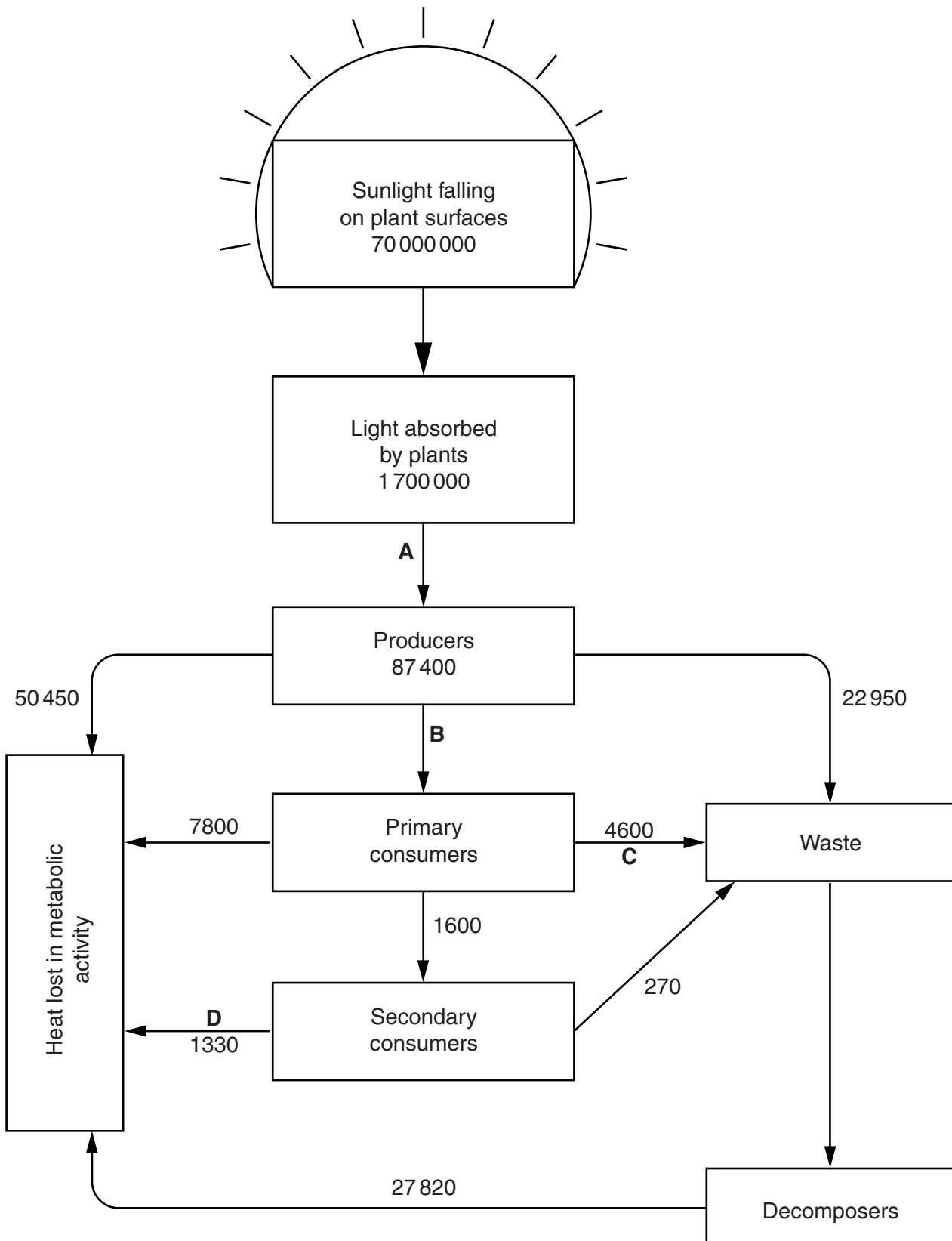


Fig. 2.1

- (a) (i) Calculate the percentage of the Sun's energy falling on the surfaces of plants that is absorbed by the plants. Use the data from **Fig. 2.1**.

Percentage of the Sun's energy = % [2]

- (ii) Suggest **two** reasons why a plant does not absorb all the sunlight.

1

.....

2

.....

[2]

- (b) Identify the processes **A – D** in **Fig. 2.1**.

Write your answer in the spaces provided in **Table 2.1**.

	Process
A	
B	
C	
D	

[4]

Table 2.1

- (c) Calculate the energy transferred from the producers to the primary consumers in process **B**.

Energy = $\text{kJm}^{-2}\text{yr}^{-1}$ [2]

(d) The amount of carbon in the ecosystem is maintained in a steady state.

(i) What is meant by the term *steady state*?

.....
..... [1]

(ii) Explain how the producers help to maintain carbon in a steady state in the ecosystem.

.....
.....
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.....
.....
..... [3]

[Total: 14]

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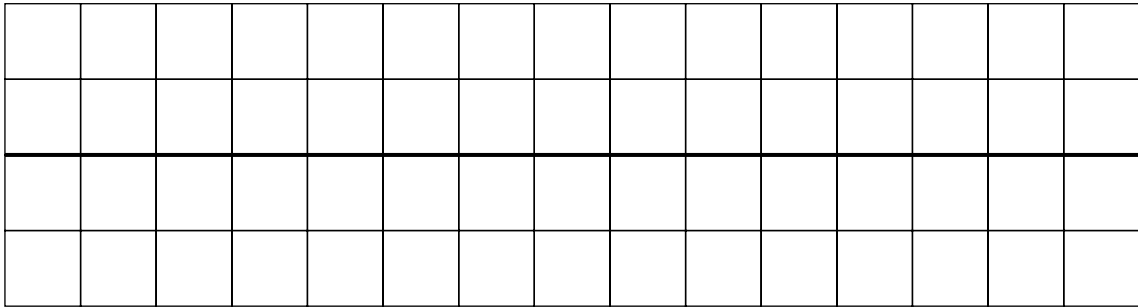
Question 3 begins on page 10

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3 This question is about electromagnetic waves.

(a) Sketch a wave with a wavelength of 6 cm on the grid below.

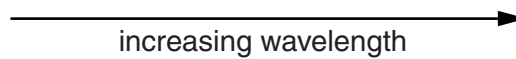
Draw at least one complete wavelength and label the amplitude.



[3]

(b) Visible light consists of a number of colours that form a spectrum.

Complete the boxes below to show the whole range of colours in white light in order of their wavelengths.



[2]

(c) Hot gases emit light. The colour of the light depends on the temperature of the gas.

Fig. 3.1 shows the intensities of different wavelengths emitted by gases at different temperatures.

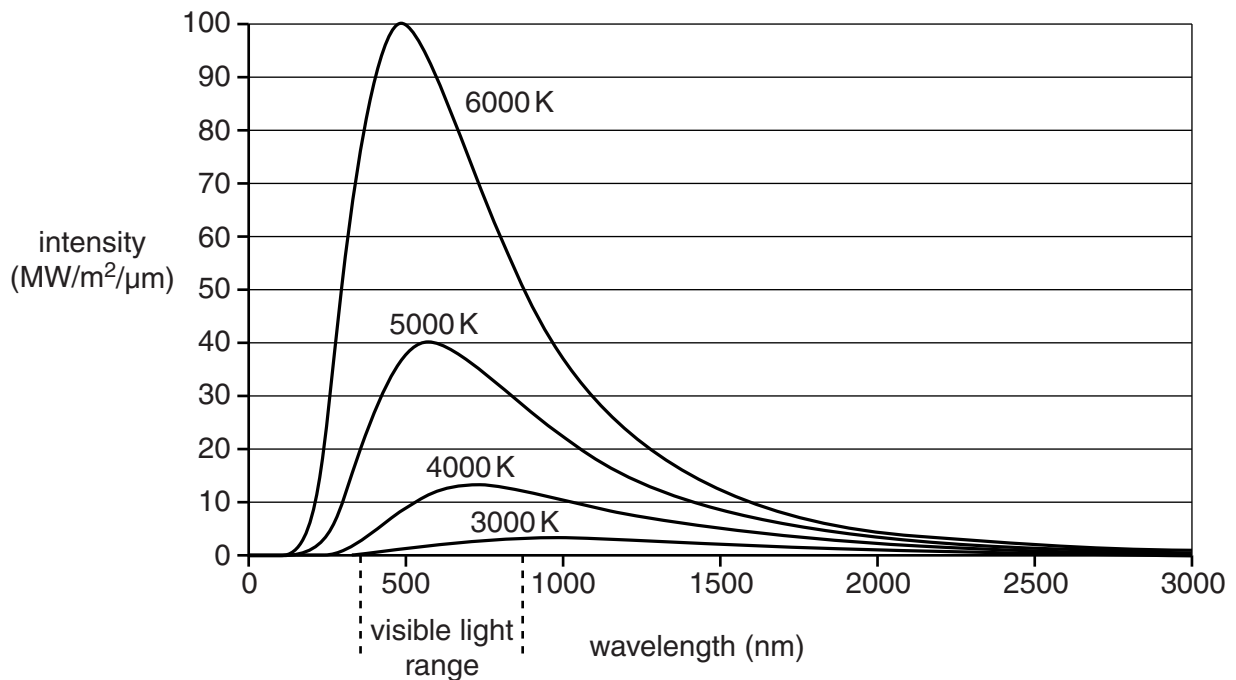


Fig. 3.1

- (i) Suggest how the colour of a gas changes as its temperature increases from 4000 K to 6000 K.

.....
..... [1]

- (ii) Give a reason for your answer.

.....
..... [1]

- (d) The human eye cannot detect all of the radiation emitted by hot gases.

- (i) Use the graph to decide what type of electromagnetic radiation cannot be detected.

..... [1]

- (ii) Give a reason for your answer.

.....
..... [1]

- (e) The human eye contains two different types of photoreceptor.

- (i) Name the part of the eye where these photoreceptors are found.

..... [1]

- (ii) Name the two types of photoreceptor cells and describe the type of light that they detect.

1

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2

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[4]

[Total: 14]

4 Respiration produces carbon dioxide.

(a) Describe the stages of respiration and state where each stage occurs in a typical cell.



In your answer, you should use appropriate technical terms, spelt correctly.

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[4]

(b) A student investigated the effect of plants and animals on the concentration of carbon dioxide in the water around them.

He set up a number of tubes containing water and indicator. He added water snails and pondweed as shown in Fig. 4.1. Tubes A – D were placed in bright light. Tubes E – H were placed in the dark.

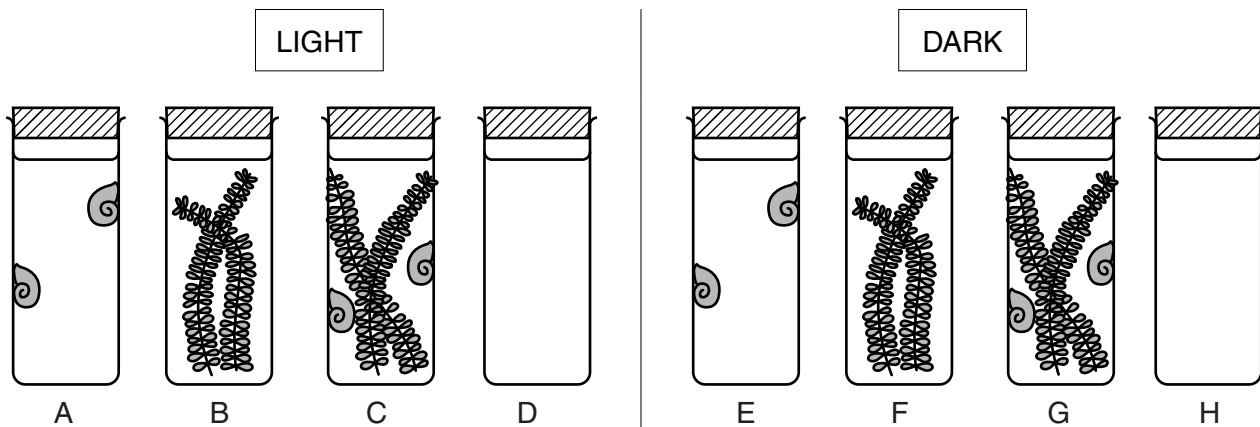


Fig. 4.1

(i) Tubes D and H are controls.

What is the purpose of these controls?

.....
 [1]

The indicator changes colour depending on the concentration of carbon dioxide present.

Concentration of carbon dioxide	Colour of indicator
Increase	Yellow
No change	Red
Decrease	Purple

(ii) In which tubes in **Fig. 4.1** would you expect to see the indicator change to yellow?

Put a tick (✓) in the correct box to show your answer.

Tube	Tick
A B C E	
A C G	
A E F G	
B C F G	
B and F only	

[1]

(iii) Tubes E – H were removed from the dark and placed in the light.

State which of these tubes will change colour and explain why the colour change occurs.

.....

 [4]

[Total: 10]

5 Weather monitoring has been improved by the use of satellites.

(a) Sensors on a satellite can use information they receive from reflected radiation to generate a digital grey-scale image.

Explain how the information is converted into an image.

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[4]

(b) Fig. 5.1 is a negative infrared image taken by a satellite over Western Europe at 8.00 am on the 18 March 2012.

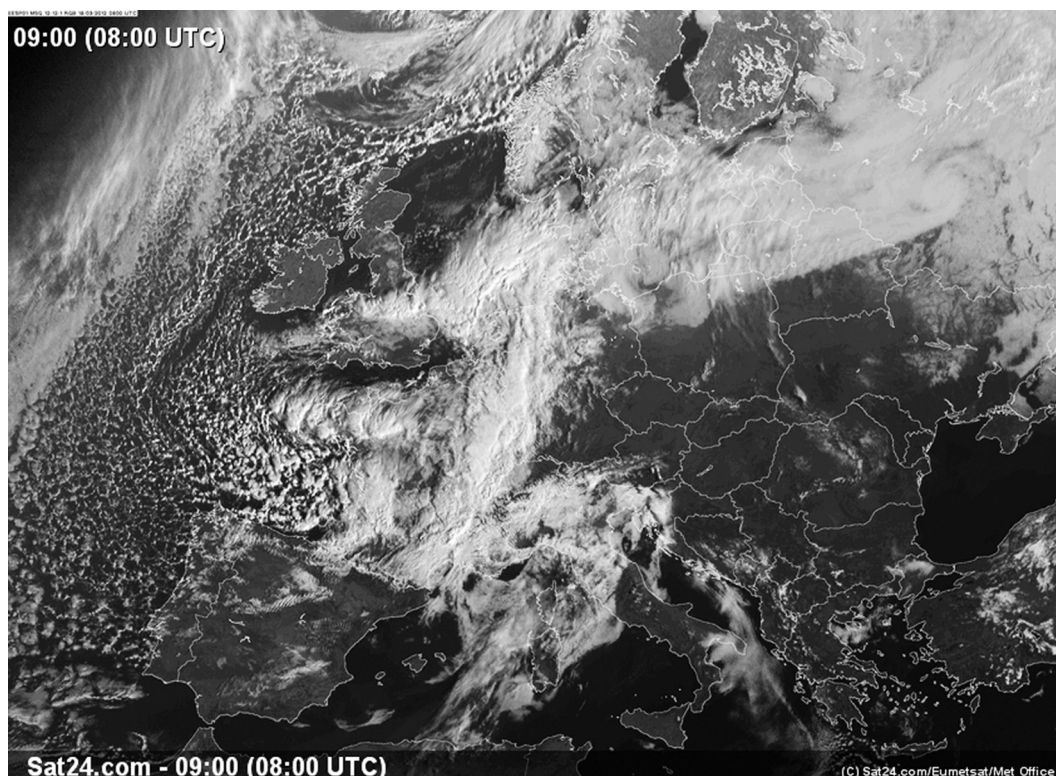


Fig. 5.1

(i) What was the weather like over the northern part of the UK when the image was taken?
..... [1]

(ii) This infrared image is a negative image. Why is it presented in this way?
.....
..... [1]

(iii) Explain what the infrared image tells you about the temperature of the clouds.
.....
.....
.....
..... [3]

[Total: 9]

END OF QUESTION PAPER

ADDITIONAL ANSWER SPACE

If additional answer space is required, you should use the following lined page. The question number(s) must be clearly shown in the margin.

A large rectangular area with a vertical solid line on the left side and horizontal dotted lines across the rest of the page, providing space for writing answers.



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