GCSE

4781/01

SCIENCE B

UNIT 1: Space, Energy and Life

FOUNDATION TIER

A.M. THURSDAY, 14 January 2016

1 hour 15 minutes plus your additional time allowance

Surname _____

Other Names _____

Centre Number _____

Candidate Number 0 _____

	For Examiner's use only		
	Question	Maximum Mark	Mark Awarded
Section A	1.	10	
	2.	10	
	3.	8	
	4.	8	
	5.	10	
Section B	6.	12	
	7.	6	
	8.	6	
	Total	70	

ADDITIONAL MATERIALS

In addition to this paper you may require a calculator and a ruler.

You will also need a copy of the RESOURCE FOLDER (Pre-Release Article) to answer SECTION B.

INSTRUCTIONS TO CANDIDATES

Use black ink, black ball-point pen or your usual method.

Write your name, centre number and candidate number in the spaces provided on the front cover.

Answer ALL questions.

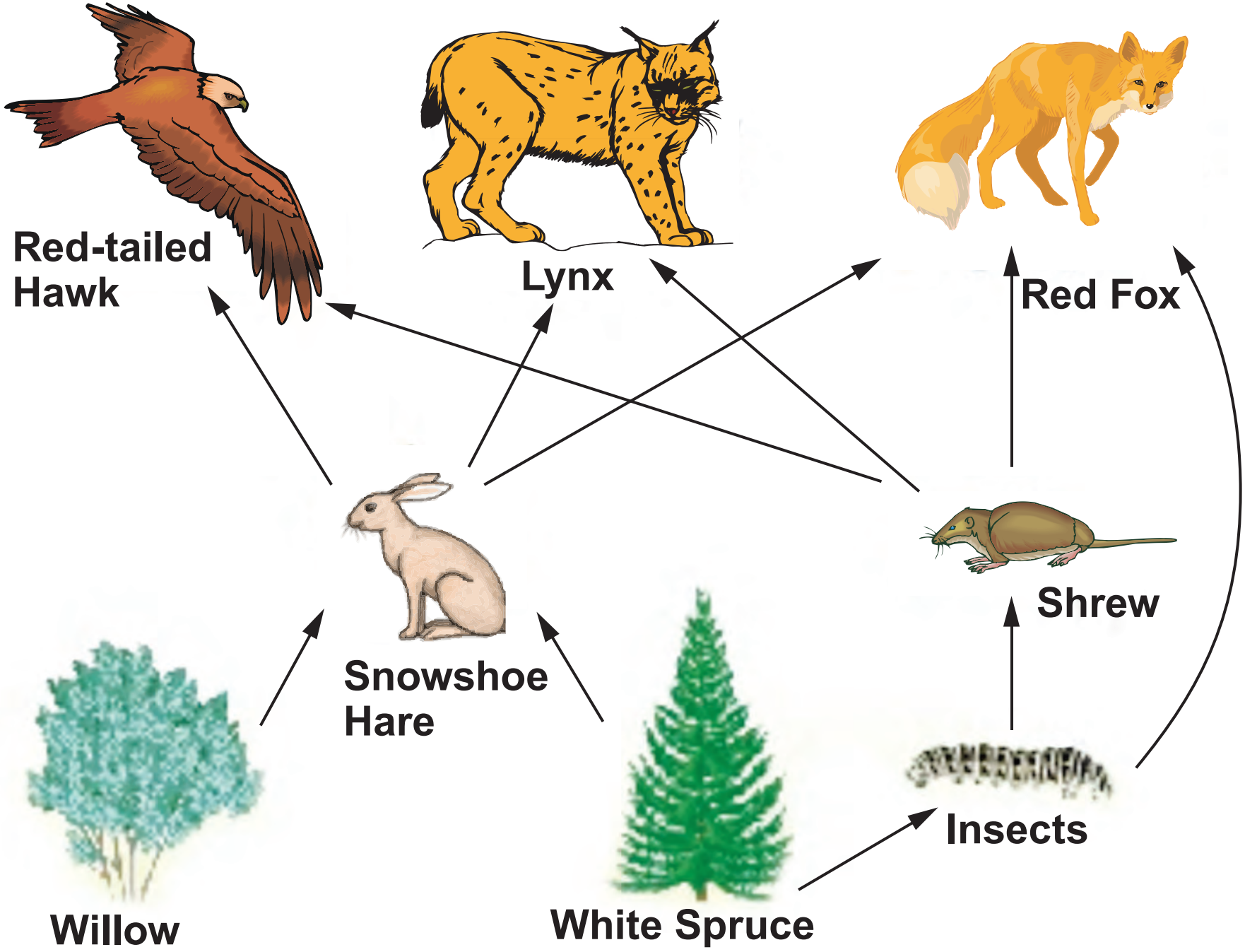
Write your answers in the spaces provided in this booklet.

INFORMATION FOR CANDIDATES

The number of marks is given in brackets at the end of each question or part-question.

You are reminded that assessment will take into account the quality of written communication (QWC) used in your answer to question 7.

SECTION B is based upon the PRE-RELEASE ARTICLE.


Red-tailed Hawk
Lynx
Red Fox
Snowshoe Hare
Shrew
Willow
White Spruce
Insects

SECTION A

Answer ALL questions in the spaces provided.

1. The picture opposite shows a food web.

(a) Answer each question using the food web.

(i) Name ONE producer. [1]

_____

(ii) Name ONE herbivore. [1]

_____

(iii) Name the prey of the shrew. [1]

_____

1(b) (i) State THREE factors that will affect the size of the white spruce population. [3]

1. _____

_____

2. _____

_____

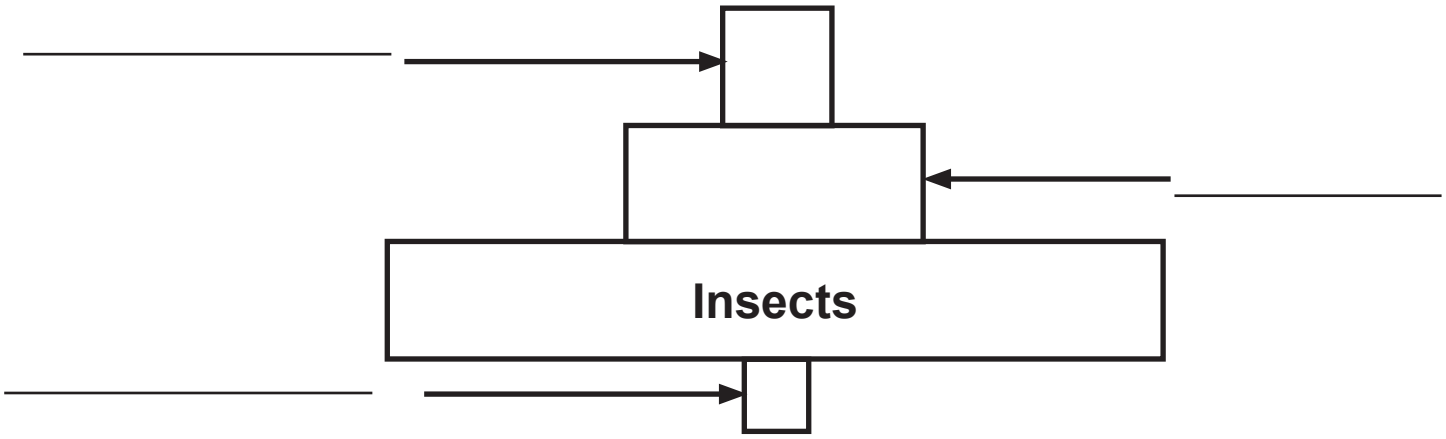
3. _____

_____

(ii) Name the source of energy for this food web. [1]

_____

1(c) Label the pyramid of numbers below for one food chain in the web: [3]



10

Model	Price (£)	Power (W)	Power (kW)	Units used per year (kWh/y)	Annual running cost (£)	Annual running cost (p)
A	350	2200	2.2	220		
B	345	2400		240	38.40	3840
C	320	2700	2.7	270	43.20	4320
D	340	2100	2.1			3360

2. A homeowner is shopping for a washing machine. He compares information about four different models as shown in the table opposite.

(a) (i) Calculate the annual running cost for model A using the equation: [2]

annual cost = cost of one unit (16p) x units used in a year

cost = _____

(ii) State the power of model B in kW. [1]

power = _____ kW

2(a) (iii) **Calculate the length of time model C uses electricity during the year, by using the equation: [2]**

$$\text{time (h)} = \frac{\text{units used}}{\text{power (kW)}}$$

time = _____ h

(iv) **State the annual running cost of model D in £. [1]**

cost = £ _____

2(a) (v) **The information assumes all models are used for the same time. Calculate the units used per year by model D. [1]**

units used = _____

2(b) Complete the table below to select which model you would recommend as the best value for money. [3]

Model	Cost to buy (£)	Annual running cost (£)	10 year running cost	Total cost over 10 years
B	345	38.40	_____	_____
C	320	43.20	_____	_____

Best value for money = model _____

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Region	Wavelength (m)	Frequency (Hz)
radio	2	150 000 000
microwave		
infra-red		
visible		
_____		
_____		
_____		

3. The table opposite gives information about different regions of the electromagnetic (em) spectrum.

(i) Complete the table by placing X-rays, gamma rays and ultraviolet in the correct positions. [2]

(ii) Calculate the speed of em waves in space using information from the table and the equation: [2]

wave speed = frequency x wavelength

speed = _____ m/s

3(iii) Complete the following sentences by underlining the correct word(s) in brackets. [4]

As you move down the table from radio waves the WAVELENGTH (decreases / stays the same / increases).

As you move down the table from radio waves the FREQUENCY (decreases / stays the same / increases).

As you move down the table from radio waves the WAVE SPEED (decreases / stays the same / increases).

As you move down the table from radio waves the WAVE ENERGY (decreases / stays the same / increases).

4(a) (i) In the table below, tick (✓) the statements that show the effects of raw sewage. [3]

Effect	(✓)
increases the number of bacteria in water	
increases oxygen content of water	
causes diseases in surfers	
decreases oxygen content of water	
increases biodiversity of river animals	

(ii) Name TWO types of chemicals used in intensive farming that cause water pollution. [2]

1. _____

_____

2. _____

_____

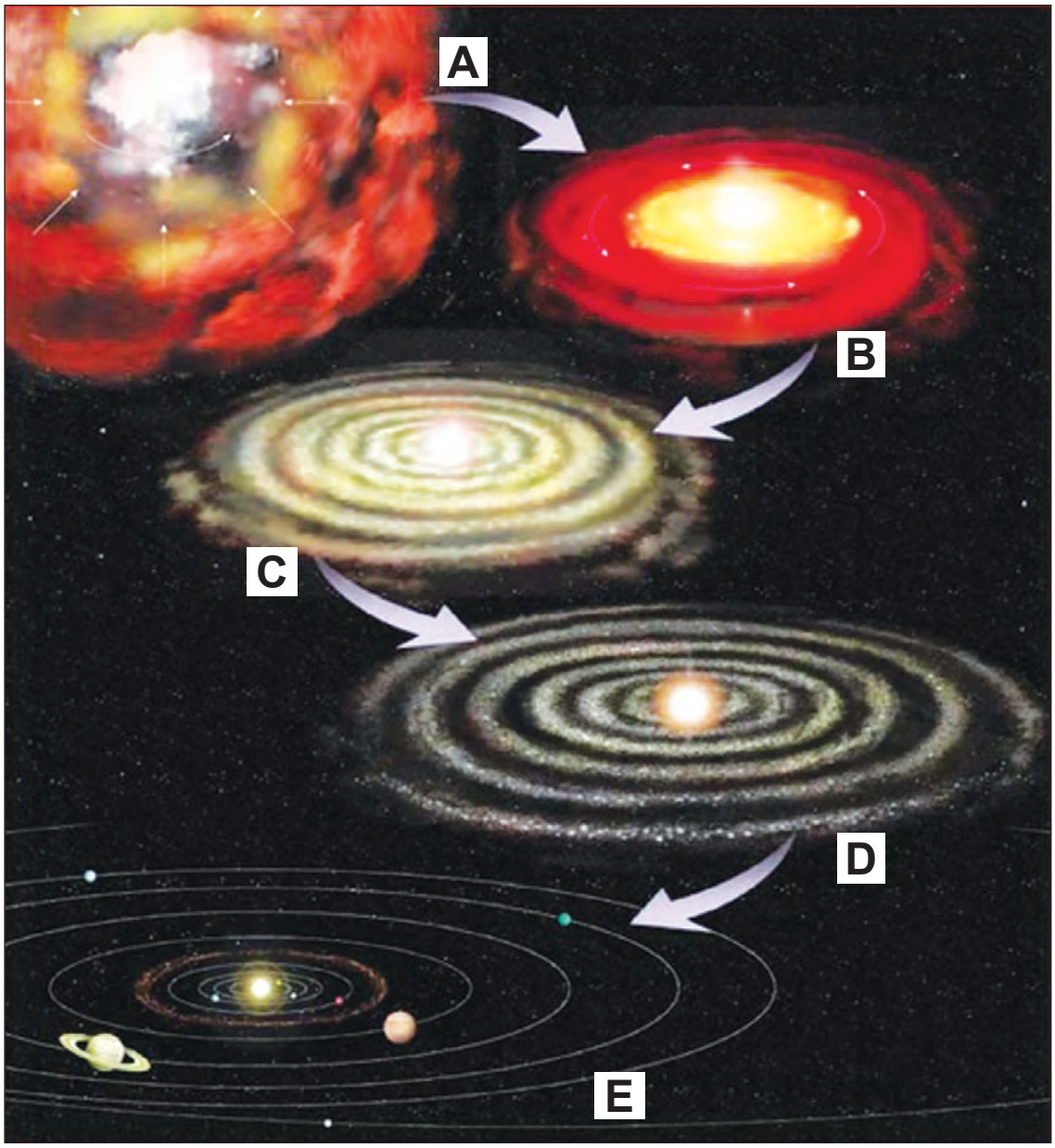
4(b) **The chart opposite shows how river quality in the UK changed over a 4 year period.**

Use the information in the chart to answer the following questions.

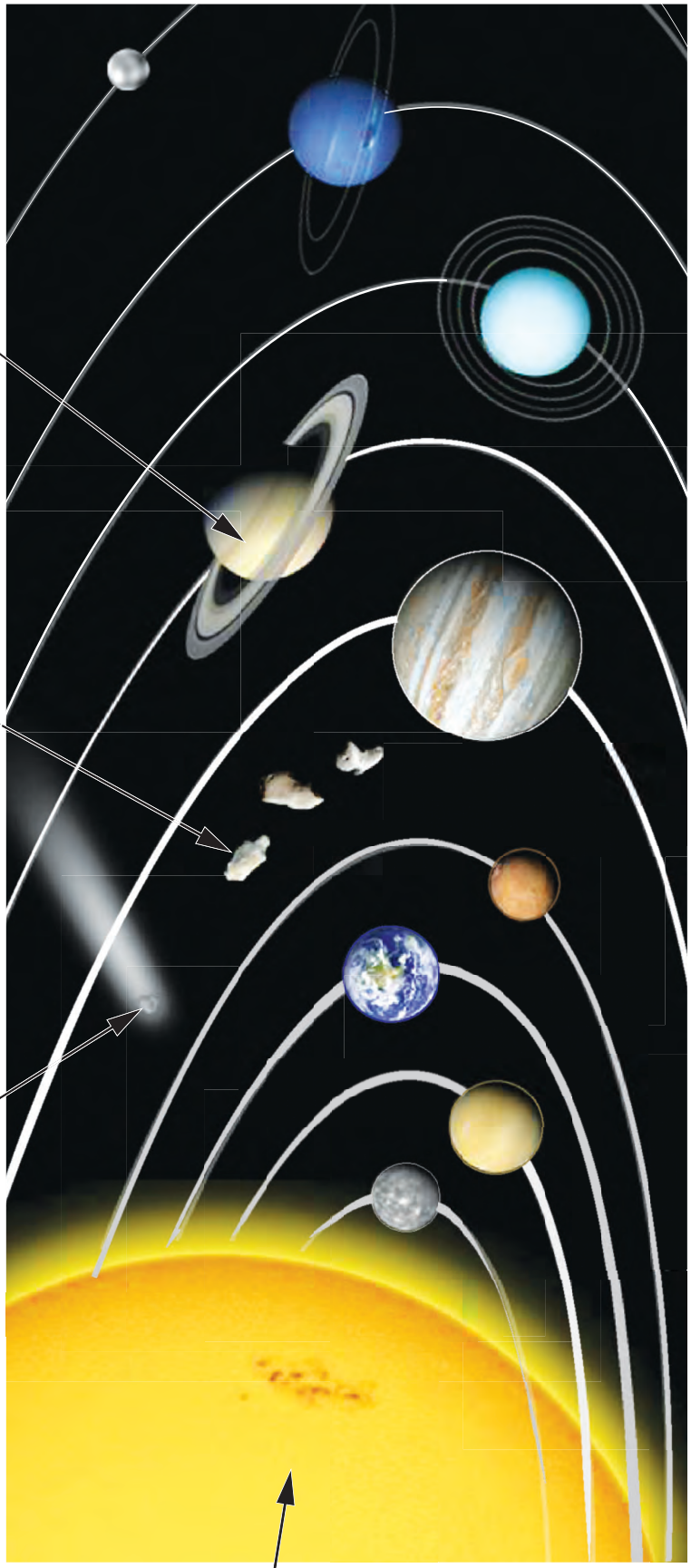
(i) **Name the country with the least 'very good' water in 1996. [1]**

(ii) **Name ONE country with NO 'bad' water quality in 2000. [1]**

(iii) **Name the country with the biggest drop in 'very good' water quality between 1996 and 2000. [1]**


A
B
C
D
E

5(a) Use the detail in the picture opposite to help you describe how the Sun and the Solar System were formed. [4]



5(b) (i) **The diagram opposite shows structures found within the Solar System. Label the structures shown by the arrows. [4]**

(ii) **Name the cloud that forms the outer edge of the Solar System. [1]**

(iii) **Name the bodies that orbit some planets but are not shown on the diagram. [1]**

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SECTION B

Answer ALL questions in the spaces provided.

Use the information in the separate Resource Folder to answer the following questions.

6(a) **Use the information in TABLE 1 to answer the question below.**

Calculate the drop in the power generated by non-renewable sources from 2010 to 2050. Assume that the maximum power generated remains at a constant 34 GW. [2]

Drop in power generation by non-renewable sources =

_____ GW

6(b) (i) **Use the information in TABLE 2 to answer the following questions.**

A 10 MW power station needs 60 000 tonnes of willow crop per year.

I. **Calculate the area of land needed to grow this amount of willow crop. [1]**

area _____ **km^2**

II. **Calculate the energy content of 60 000 tonnes of willow crop. [1]**

energy content = _____ **units**

6(b) (ii) Explain why burning biofuels is more environmentally friendly than burning fossil fuels. [2]

6(c) **Use the information about wind power on PAGE 6 and 7 to answer the following question.**

Complete the table by ticking (✓) the correct column for each steady wind speed.

One has been completed as an example. **[3]**

Steady wind speed (m/s)	Zero power output	Rated output power	Between zero and rated output power
2.9	✓		
27.2			
19.6			
12.2			

6(d) Describe the advantages of tidal water turbines compared to wind turbines using your knowledge and the information in TABLE 3. [3]

7. Compare the use of wind power and nuclear power to generate electricity using the information in TABLE 4 and your own knowledge. [6 QWC]

Include in your answer, details about:

- **cost effectiveness;**
- **effect on the environment;**
- **reliability.**

6

8. Use the information about solar panels on PAGE 11 to answer the questions that follow.

(i) Calculate the efficiency of a solar panel using the equation: [2]

$$\text{percentage efficiency} = \frac{\text{useful output power}}{\text{total input power}} \times 100$$

percentage efficiency = _____

8(ii) **Household voltage is 230 V. Calculate the maximum current that can be drawn from a solar panel of area 1 square metre, using the equation:**

[2]

$$\text{current} = \frac{\text{power}}{\text{voltage}}$$

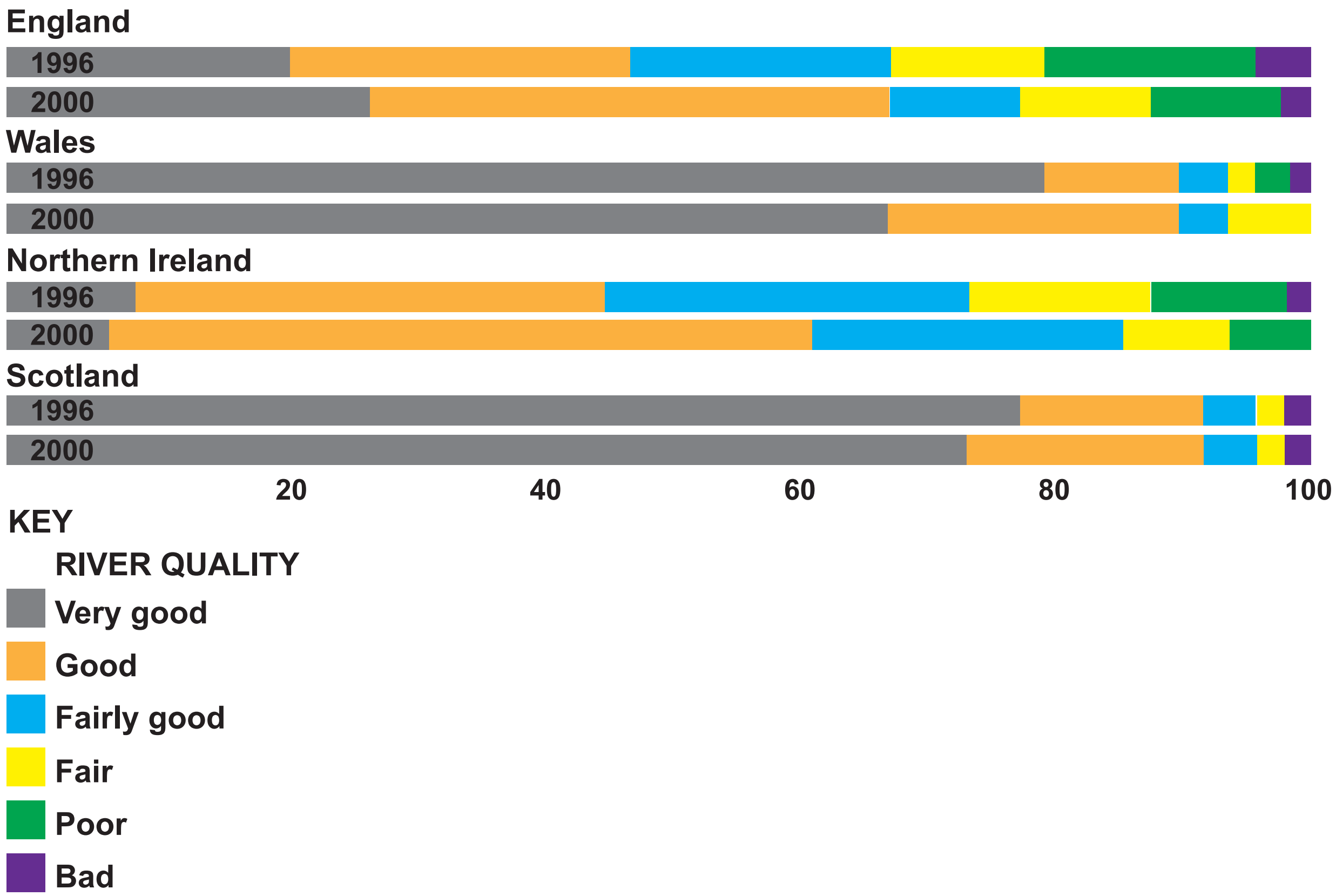
current = _____ A

8(iii) Calculate the energy (Wh) produced by a 5 square metre solar panel in 6 hours of good sunlight. [2]

energy = _____ Wh

END OF PAPER

6


England
1996
2000
Wales
1996
2000
Northern Ireland
1996
2000
Scotland
1996
2000
20
40
60
80
100
KEY
RIVER QUALITY
Very good
Good
Fairly good
Fair
Poor
Bad