

Please write clearly in	n block capitals.	
Centre number	Candidate number	
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# Level 3 Certificate/Extended Certificate APPLIED SCIENCE

Unit 3 Science in the Modern World

Time allowed: 1 hour 30 minutes

#### **Materials**

For this paper you must have:

- a clean copy of the pre-release Sources A, B, C and D
- a calculator.

#### Instructions

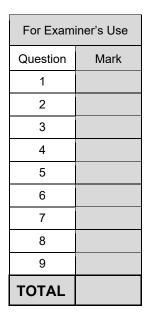
- Use black ink or black ball-point pen.
- Fill in the boxes at the top of this page.
- Answer all questions.
- You must answer the questions in the spaces provided. Do not write outside the box around each page or on blank pages.
- If you need extra space for your answer(s), use the lined pages at the end of this book. Write the question number against your answer(s).
- Do all rough work in this book. Cross through any work you do not want to be marked.

#### Information

- You will be provided with copies of the pre-release Sources A, B, C and D.
- There are two sections in this paper Section A and Section B.
- You should answer all questions in each section.
   You should spend approximately 1 hour on Section A and 30 minutes on Section B.
- The marks for questions are shown in brackets.
- The maximum mark for this paper is 60.

#### **Advice**

Read each question carefully.





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This section is based on <b>Sources A</b> , <b>B</b> , <b>C</b> and <b>D</b> .
Answer all questions in this section.
<b>Source A</b> describes NASA's celebrations to commemorate the Apollo 11 landing on the moon.
Use <b>Source A</b> to answer Question <b>01</b> .
In what year did Apollo 11 land on the moon?  [1 mark]
Calculate the world population in the year that Apollo 11 landed on the moon.  [1 mark]
World population = million
As part of the celebrations, NASA showed the original moonwalk on NASA TV.
A video of the moonwalk could also be watched on YouTube.
What was the total number of people who had watched the moonwalk on either NASA TV or YouTube?
Use Source A.
Tick (✓) one box.
1 025 500 [1 mark]
1 255 000
1 502 500
1 525 000



0 1.4	Source A states that NASA was 'looking forward to its next giant leap'.		Do not write outside the box
	What was NASA planning as its next giant leap?	[1 mark]	
			4



Do not write outside the box

0 2	Source B describes the difficulties involved in landing on the moon.
	Use <b>Source B</b> to answer Question <b>02</b> .
0 2.1	How many <b>successful</b> soft-landings have there been on the moon?
	Tick (✓) one box. [1 mark]
	19 [1 mank]
	22
	25
	30
0 2.2	Give <b>two</b> issues that could cause an <b>unsuccessful</b> moon landing.  [2 marks]
	1
	2
0 2.3	It can be argued that moon landings are more successful if they have people on board the spacecraft.
	Give <b>two</b> pieces of evidence to show how <b>Source B</b> supports this view. [2 marks]
	1
	2



0 2.4	Give <b>two</b> ways that NASA is planning to increase the chance of successful landings in the future.	outside the
	Do <b>not</b> refer to having people on board the spacecraft. [2 marks]	
	1	
	2	7

Do not write outside the box

3 . 1	Sport and exercise scientis by NASA.	sts are some of the many types of scientists emp	loyed
	Suggest the role of a sport	and exercise scientist working for NASA.	[2 marks]
	-		
3 . 2	Source B refers to spacec	raft from several different countries.	
		acecraft and the country that each comes from.	[2 marks]
	Spacecraft 1	Country	
	Spacecraft 2	Country	
	Spacecraft 2	Country	



0 4	Source C describes a NASA mission to investigate the possibility of life on Europa.	outside box
	Living organisms require water to survive.	
	Evidence suggests that there may be oceans below the crust of Europa.	
	Use <b>Source C</b> to answer Question <b>04</b> .	
0 4.1	Give <b>one</b> piece of evidence that NASA has that there may be water on Europa.  [1 mark]	
0 4.2	Give <b>two other</b> conditions required for living organisms that scientists believe may be present on Europa.  [2 marks]	
	1	
	2	
		3



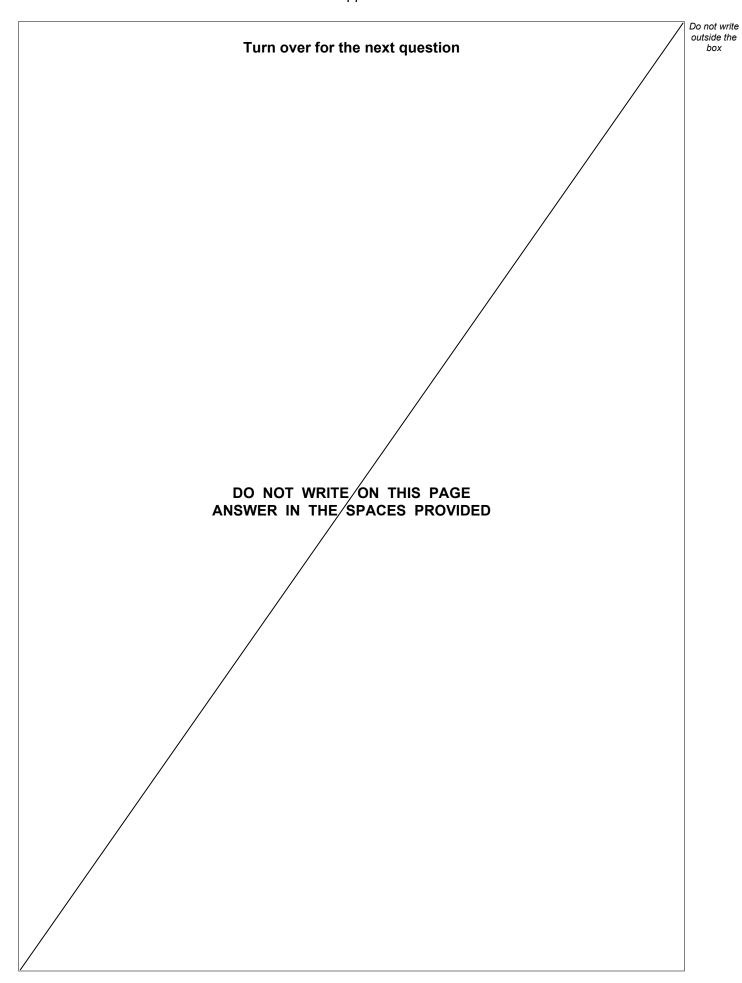
0 5	No spacecraft has ever landed on Europa.	
	Use <b>Source C</b> to answer Question <b>05</b> .	
0 5.1	What conditions around Jupiter have prevented spacecraft from landing on Eu	ıropa? [1 mark]
0 5.2	Why have these conditions prevented spacecraft from landing on Europa?	[1 mark]
0 5.3	Give <b>two</b> measurements that Europa Clipper will make during its mission.  [2]	2 marks]
	2	
0 5.4	How will the Europa Clipper mission take measurements from Europa if it can on Europa?	not land



0 5.5	Source C states that Europa Clipper is 'not the only mission heading for Europa'.	Do not write outside the box
	Give <b>two</b> ways that the Jupiter Icy Moons Explorer mission is different to the Europa Clipper mission.	
	[2 marks]	
	1	
	2	
		7

0 6	<b>Source D</b> refers to the space exploration plans of Elon Musk and his company SpaceX.	outsic b
0 6.1	Give <b>one</b> reason why the author of <b>Source D</b> believes that SpaceX will succeed.  [1 mark]	
0 6 . 2	The author of <b>Source D</b> states that 'the risks of contaminating Mars, injuring astronauts and damaging the environment are very real'.	
	Describe how sending humans to Mars could cause each risk.  [3 marks]	
	Contaminating Mars	
	Injuring astronauts	
	Damaging the environment	
0 6.3	Give <b>two</b> actions that the author of <b>Source D</b> believes could reduce the risks in Question <b>06.2</b> . [2 marks]	
	1	
	2	6





0 7	You are employed by NASA to promote space exploration and encourage post-16 students towards a career in the space industry.
	You have been asked to recommend articles for post-16 students.
	The articles should:
	<ul> <li>be effective at promoting space exploration and a career in the space industry</li> <li>use effective language and structure which is appropriate for the students</li> <li>come from valid sources.</li> </ul>
	Describe the effectiveness and validity of <b>Sources A</b> , <b>B</b> , <b>C</b> and <b>D</b> .  [9 marks]



Do not write outside the box

Extra space		



## **Section B**

Answer all questions in this section.

**Table 1** shows data on eight planets in our solar system.

Table 1

Planet	Distance from the Sun / km	Time taken to orbit the Sun / Earth days	Diameter / km
Earth	149 600 000	365	12 756
Jupiter	778 330 000	4 328	142 984
Mars	227 940 000	687	6 805
Mercury	57 910 000	88	4 879
Neptune	4 501 000 000	60 190	49 528
Saturn	1 424 600 000	10 759	116 464
Uranus	2 873 550 000	30 687	51 118
Venus	108 200 000	225	12 104

Use the data in Table 1 to answer Question 08.

0 8.1	Give <b>two</b> facts about Mercury in comparison to the other planets.	[2 marks]
	1	
	2	
0 8.2	Which planet is the closest to the <b>Earth</b> ?	[1 mark]

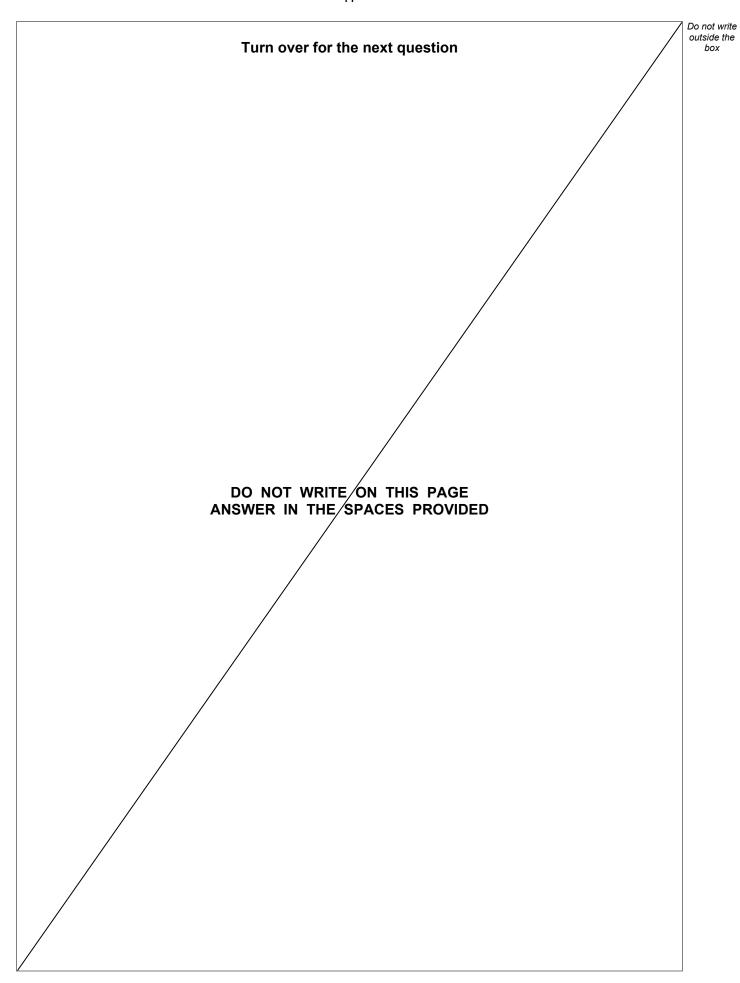


	15	
0 8.3	Describe the relationship between the distance from the Sun and the time taken to orbit the Sun.	Do not wr outside th box
	[1 mark]	
0 8.4	One Earth year is the time it takes for the Earth to orbit the Sun.	
	Calculate how many Earth years it would take for Saturn to orbit the Sun.  [2 marks]	
	Number of Earth years =	
0 8 . 5	There is no relationship between the diameter of the planet and the distance from the Sun.	
	Give <b>two</b> pieces of evidence from <b>Table 1</b> to show there is no relationship. [2 marks]	
	1	
	2	
	Question 8 continues on the next page	

1 5

		_
	Ceres is a dwarf planet in our solar system.  Ceres takes 4.6 Earth years to orbit the Sun.	Do not write outside the box
0 8.6	Suggest the position of Ceres in our solar system.	
	Use data from Table 1. [2 marks]	
		10







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U	9

Figure 1 shows information published in November 2019 about space telescopes.

### Figure 1

- One million observations have been made using the Hubble Space Telescope (also known as Hubble) since its launch in 1990.
- Hubble orbits the Earth 550 kilometres above the Earth's surface.
- 16 000 peer-reviewed scientific articles have been written using data from Hubble and these have been referenced 800 000 times in further articles.
- NASA plans to launch the James Webb Space Telescope (known as JWST) in 2021 at a cost of \$10 billion.
- JWST has a circular mirror with a radius of 3.25 metres.
- Hubble has a circular mirror with a radius of 1.20 metres.
- JWST will be 1.5 million kilometres from Earth.

0 9 . 1	Calculate the mean number of observations made using Hubble each year between its launch and when the data in Figure 1 was published.  [2 marks]
	Mean number of observations each year =
0 9.2	Calculate the mean number of times each peer-reviewed article has been referenced in a further article.
	[1 mark]
	Mean number =



0 9.3	Give <b>one</b> reason why an author would choose to refer to a peer-reviewed article in their own article.  [1 mark]	Do not write outside the box
0 9.4	NASA claims that the mirror used in JWST has an area which is more than 7 times bigger than the mirror used in Hubble.	
	Show that this claim is correct.	
	Use calculations and data from <b>Figure 1</b> .	
	The equation for the area of a circle = $\pi r^2$	
	where $\pi$ = 3.14 and $r$ = radius of the circle. [3 marks]	
0 9 . 5	Suggest <b>one</b> reason why a bigger mirror will make JWST a better space telescope than Hubble.	
	[1 mark]	
	Question 9 continues on the next page	
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Different types of scientists are involved in constructing and using space telescopes such as Hubble and JWST.

Give the name of each type of scientist described below.

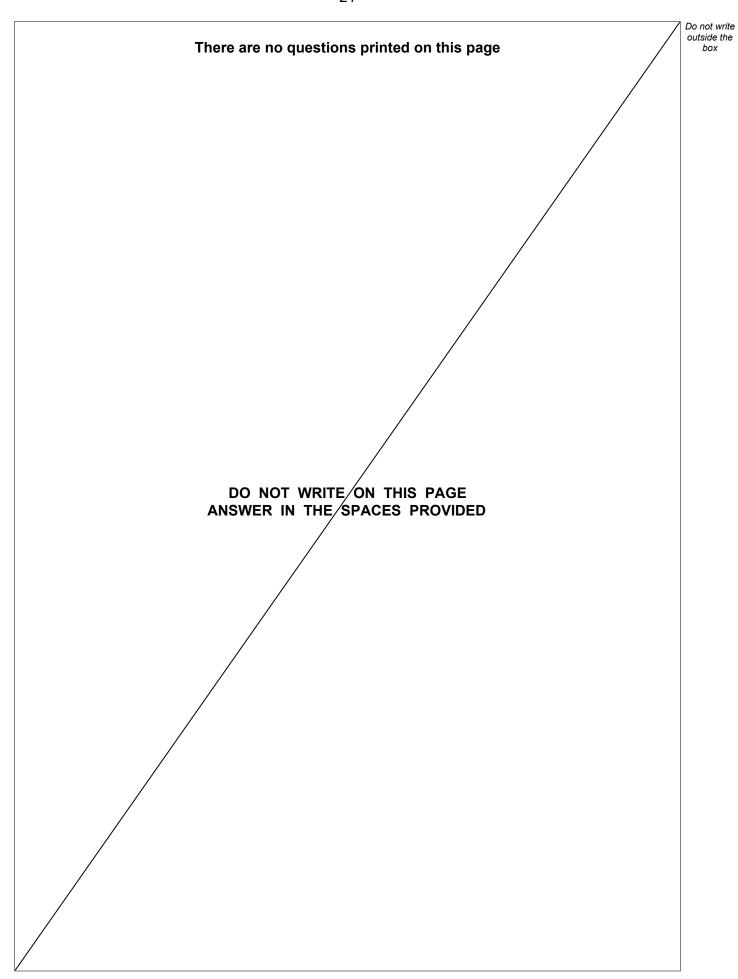
[2 marks]

Scientist who does tests to determine what space telescopes should be made from.

Scientist who studies planets and the solar system using a space telescope.

# **END OF QUESTIONS**







Question number	Additional page, if required. Write the question numbers in the left-hand margin.



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