

Please write clearly in block capitals.

Centre number

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Candidate number

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Surname

Forename(s)

Candidate signature

I declare this is my own work.

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.

For Examiner's Use	
Question	Mark
1	
2	
3	
4	
5	
6	
7	
8	
9	
TOTAL	

Advice

Read each question carefully.



Section A

This section is based on **Sources A, B, C and D.**

Answer **all** questions in this section.

0 1

Source A describes NASA's celebrations to commemorate the Apollo 11 landing on the moon.

Use **Source A** to answer Question **01**.

0 1 . 1

In what year did Apollo 11 land on the moon?

[1 mark]

0 1 . 2

Calculate the world population in the year that Apollo 11 landed on the moon.

[1 mark]

World population = _____ million

0 1 . 3

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 mark]

1 025 500

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'.

What was NASA planning as its next giant leap?

[1 mark]

4

Turn over for the next question

Turn over ►



0 2

Source B describes the difficulties involved in landing on the moon.

Use **Source B** to answer Question **02**.

0 2 . 1

How many **successful** soft-landings have there been on the moon?

Tick (✓) **one** box.

[1 mark]

19

22

25

30

0 2 . 2

Give **two** issues that could cause an **unsuccessful** 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 **two** pieces of evidence to show how **Source B** supports this view.

[2 marks]

1 _____

2 _____



0 2 . 4

Give **two** ways that NASA is planning to increase the chance of successful landings in the future.

Do **not** refer to having people on board the spacecraft.

[2 marks]

1 _____

2 _____

7

Turn over for the next question

Turn over ►



0 3 . 1

Sport and exercise scientists are some of the many types of scientists employed by NASA.

Suggest the role of a sport and exercise scientist working for NASA.

[2 marks]

0 3 . 2

Source B refers to spacecraft from several different countries.

Give the names of **two** spacecraft and the country that each comes from.

[2 marks]

Spacecraft 1 _____ Country _____

Spacecraft 2 _____ Country _____

4



0	4
---	---

Source C describes a NASA mission to investigate the possibility of life on Europa.

Living organisms require water to survive.

Evidence suggests that there may be oceans below the crust of Europa.

Use **Source C** to answer Question **04**.

0	4	.	1
---	---	---	---

Give **one** piece of evidence that NASA has that there may be water on Europa.

[1 mark]

0	4	.	2
---	---	---	---

Give **two other** conditions required for living organisms that scientists believe may be present on Europa.

[2 marks]

1 _____

2 _____

3

Turn over for the next question

Turn over ►



0 5 No spacecraft has ever landed on Europa.

Use **Source C** to answer Question **05**.

0 5 . 1 What conditions around Jupiter have prevented spacecraft from landing on Europa? **[1 mark]**

0 5 . 2 Why have these conditions prevented spacecraft from landing on Europa? **[1 mark]**

0 5 . 3 Give **two** measurements that Europa Clipper will make during its mission. **[2 marks]**

1

2

0 5 . 4 How will the Europa Clipper mission take measurements from Europa if it cannot land on Europa? **[1 mark]**



0 5 . 5

Source C states that Europa Clipper is 'not the only mission heading for Europa'.

Give **two** ways that the Jupiter Icy Moons Explorer mission is different to the Europa Clipper mission.

[2 marks]

1 _____

2 _____

7

Turn over for the next question

Turn over ►



0 6

Source D refers to the space exploration plans of Elon Musk and his company SpaceX.

0 6 . 1

Give **one** reason why the author of **Source D** believes that SpaceX will succeed.

[1 mark]

0 6 . 2

The author of **Source D** 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 **two** actions that the author of **Source D** believes could reduce the risks in Question **06.2**.

[2 marks]

1 _____

2 _____

6



Turn over for the next question

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ANSWER IN THE SPACES PROVIDED**

Turn over ►



Section BAnswer **all** questions in this section.**0 8****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 **two** facts about Mercury in comparison to the other planets.**[2 marks]**

1 _____

2 _____

0 8 . 2Which planet is the closest to the **Earth**?**[1 mark]**



0 8 . 3

Describe the relationship between the distance from the Sun and the time taken to orbit the Sun.

[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 **two** pieces of evidence from **Table 1** to show there is no relationship.

[2 marks]

1 _____

2 _____

Question 8 continues on the next page

Turn over ►

Ceres is a dwarf planet in our solar system.

Ceres takes 4.6 Earth years to orbit the Sun.

0 8 . 6 Suggest the position of Ceres in our solar system.

Use data from **Table 1**.

[2 marks]

10



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0 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 **one** reason why an author would choose to refer to a peer-reviewed article in their own article.

[1 mark]

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 **Figure 1**.

The equation for the area of a circle = πr^2

where $\pi = 3.14$ and r = radius of the circle.

[3 marks]

0 9 . 5

Suggest **one** reason why a bigger mirror will make JWST a better space telescope than Hubble.

[1 mark]

Question 9 continues on the next page

Turn over ►

0 9 . 6

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.

10

END OF QUESTIONS



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