A

AQA

Surname _____

Other Names _____

Centre Number _____

Candidate Number _____

Candidate Signature _____

I declare this is my own work.

Level 3 Certificate/Extended Certificate

APPLIED SCIENCE

Unit 3 Science in the Modern World

ASC3

Time allowed: 1 hour 30 minutes

At the top of the page, write your surname and other names, your centre number, your candidate number and add your signature.

[Turn over]

JUN22ASC301

For this paper you must have:
- **a clean copy of the pre-releases SOURCES A, B, C and D**
- **a calculator.**

INSTRUCTIONS

- **Use black ink or black ball-point pen.**
- **Answer ALL questions.**
- **You must answer the questions in the spaces provided. Do NOT write 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.**

DO NOT TURN OVER UNTIL TOLD TO DO SO

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? [1 mark]

Use SOURCE A.

Tick (✓) ONE box.

- ☐ **1 025 500**
- ☐ **1 255 000**
- ☐ **1 502 500**
- ☐ **1 525 000**

[Turn over]

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

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? [1 mark]

Tick (✓) ONE box.

- ☐ **19**
- ☐ **22**
- ☐ **25**
- ☐ **30**

[Turn over]

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]

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

[Turn over]

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]

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 take measurements from Europa if it cannot land on Europa? [1 mark]

_____

_____

_____

[Turn over]

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

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]

_____

_____

_____

[Turn over]

0 6 . 2

The author of SOURCE D states that 'the risks of contaminating Mars, injuring astronauts and damaging the enviroment 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

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:

- **be effective at promoting space exploration and a career in the space industry**
- **use effective language and structure which is appropriate for the students**
- **come from valid sources.**

Describe the effectiveness and validity of SOURCES A, B, C and D. [9 marks]

9

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[Turn over]

SECTION B

Answer 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 . 2

Which planet is the closest to the EARTH? [1 mark]

_____

_____

[Turn over]

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 on page 26 to show there is no relationship. [2 marks]

1 _____

_____

_____

2 _____

_____

_____

[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 on page 26. [2 marks]

_____

_____

_____

_____

_____

_____

10

BLANK PAGE

[Turn over]

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 = _____

[Turn over]

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 on page 32.

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

where π = 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]

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

BLANK PAGE

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

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Write the question numbers in the left-hand margin.

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

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