CAMBRIDGE
OCR

For issue on or after: Monday 16 November 2026

Level 3 Cambridge Technical in Applied Science

05874 Unit 23: Scientific research techniques

Pre-release material

To prepare candidates for the examination taken on Friday 15 January 2027 – Afternoon

C348--2701

Please write clearly in black ink. **Do not write in the barcodes.**

Centre number | | | | | | Candidate number | | | | |

First name(s) _____

Last name _____

Date of birth | D | D | M | M | Y | Y | Y | Y |

INSTRUCTIONS

- Seven days before the exam, hand in this booklet to your teacher. This booklet will be given back to you at the start of the exam.
- Do **not** take any other notes into the exam.
- At the end of the exam, hand in this booklet with your exam paper.

INFORMATION

- This document has **8** pages.

© Cambridge OCR 2027 [R/615/3169] DC (WW) 365647/3

Source A

Adapted from: Self-driving cars could be on UK roads by 2026 after new law is signed [1]

Self-driving cars could be on UK roads by 2026 following the introduction of the Automated Vehicles Act (AVA) [2], which sets out the rules governing the much-vaunted technology.

At its core, the new legislation is about safer roads, bolstering self-driving technology in a bid to reduce human error, which the government said contributes to 88% of road collisions.

Self-driving cars will need to consistently operate at the same level as 'a careful and competent human driver'. On top of that, they'll also need to meet a raft of safety standards before being officially permitted to join the Secretary of State's official list of self-driving cars before they head out into the wild.

The car has to be "designed or adapted to travel autonomously", and be "capable of doing so, safely and legally" by an operator who has a "good reputation", the cash to put things right and a respect for the rules. In the event that something goes wrong in autonomous mode, the Act clearly sets liability at the door of the operator, including "insurance providers, software developers and automotive manufacturers".

Oxa [3] is one of the UK's leading companies on autonomous vehicle (AV) software development. Paul Newman, founder of Oxa, said: "We now have autonomous vehicle legislation, which is more comprehensive in scope and clearer in its requirements than in any other country."

"The act gives the UK new momentum as developers like Oxa will need to comply with the world's most comprehensive autonomous vehicle laws to deploy technology in vehicles here. Meeting the highest AV standards will make British companies global leaders with technology that is the safest, and Artificial Intelligence (AI) systems the most trusted – all key to building business and public trust in autonomy globally."

The government also claims the AVA shows the UK's economic strength. It is calculated that the sector could create over 38,000 jobs, bring £66 billion into the economy [4] and enable those who struggle with personal mobility to have more freedom.

On the FleetNews website, [5] Alex Kendall, co-founder and boss of Wayve, said: "This is a critical milestone for the UK's deployment of self-driving technology and cements the UK as a global leader in regulating this sector."

"Self-driving technology promises a safer, smarter and more sustainable future of transport. There is still some way to go with secondary legislation before we can reap the full benefits of self-driving vehicles in the UK, but we are confident the government will prioritise these next steps so this technology can be deployed as soon as possible."

Simon Williams, head of policy at the RAC said: "This is a major step on the road to autonomous vehicles appearing on the UK's roads. But there is lots of work still to do, not least bringing drivers along on the journey. RAC [6] research conducted last year showed 58% of drivers are scared by the idea of fully autonomous vehicles and just 15% think they will make the roads safer, so there needs to be a real culture change if we are to see the public fully embrace them."

[1] https://www.topgear.com/car-news/tech/self-driving-cars-could-be-uk-roads-2026-after-new-law-signed

[2] https://www.legislation.gov.uk/ukpga/2024/10/contents

© Cambridge OCR 2027

[3] https://oxa.tech/

[4] https://www.topgear.com/car-news/tech/self-driving-cars-and-connected-tech-could-generate-ps66bn-uk

[5] https://www.fleetnews.co.uk/news/self-driving-vehicles-within-two-years-as-new-law-introduced

[6] https://media.rac.co.uk/news/automated-vehicles-act-becomes-law-rac-reaction-484076

Source B

Extracted and adapted from: Regulating Automated Driving – The UK Insurer View [7]

Once a vehicle is capable of driving itself the condition of insurance and, in particular, liability will shift. This is especially relevant in the UK market where the covered risk relates to the driver and not the vehicle, a position which differs from many European countries. It is therefore especially relevant that adequate data is recorded to ensure that liability can be identified and rapid compensation offered.

In order to identify the 'at fault' party (either the car or the driver) adequate and open access to crash data is vital. Although proposals are in place for the provision of mandatory Data Storage System for Automated driving (DSSA) there are limitations in these existing proposals that will not allow an efficient and fair insurance claims process. Therefore, international insurers have proposed augmented requirements, including the ability to read event data without specialist tools and the provision to transmit this data immediately after an event. It is also important that all events are covered and not just severe crashes that lead to airbag deployment.

It is unarguable that the market entry of Automated Driving systems requires development of an international standard for the transparent storage of an agreed minimum level of vehicle-related information. This is critical to ensure that, in the event of a collision, it can easily be established whether the driver, or the vehicle, was in control of the vehicle at the time and Global Regulators already use the term Data Storage System for Automated driving (DSSA) to identify the necessary process.

Data Fields to be recorded and stored are:

1. GPS-event time stamp
2. GPS-event location
3. Automated Status – on or off
4. Automated Mode – Parking or Driving
5. Automated Transition time stamp
6. Record of Driver Intervention of steering or braking, throttle or indicator
7. Time since last driver interaction
8. Driver Seat Occupancy
9. Driver Belt Latch

It is our position that a set of technical and occupant information data has to be recorded that will allow a fact-based assessment of the cause of any collision involving vehicles that have Automated Driving systems.

[7] https://www.abi.org.uk/globalassets/files/publications/public/motor/2017/07/regulating-automated-driving/

© Cambridge OCR 2027

Source C

Adapted from: How Do Autonomous Cars Work? [8]

Autonomous cars rely on sensors, actuators, complex algorithms, machine learning systems and powerful processors to execute software.

Autonomous cars create and maintain a map of their surroundings based on a variety of sensors situated in different parts of the vehicle. Radar sensors monitor the position of nearby vehicles. Video cameras detect traffic lights, read road signs, track other vehicles and look for pedestrians. Lidar (light detection and ranging) sensors bounce pulses of light off the car's surroundings to measure distances, detect road edges and identify lane markings. Ultrasonic sensors in the wheels detect curbs and other vehicles when parking.

Sophisticated software then processes all this sensory input, plots a path and sends instructions to the car's actuators, which control acceleration, braking and steering. Hard-coded rules, obstacle avoidance algorithms, predictive modelling and object recognition help the software follow traffic rules and navigate obstacles.

What are the Challenges with Autonomous Cars?

Fully autonomous (Level 5) cars are undergoing testing in several pockets of the world, but none are yet available to the general public. We are still years away from that. The challenges range from the technological and legislative to the environmental and philosophical. Here are just some of the unknowns.

Lidar and Radar

Lidar is expensive and is still trying to strike the right balance between range and resolution. If multiple autonomous cars were to drive on the same road, would their lidar signals interfere with one another? And if multiple radio (radar) frequencies are available, will the frequency range be enough to support mass production of autonomous cars?

Weather Conditions

What happens when an autonomous car drives in heavy precipitation? If there is a layer of snow on the road, lane dividers disappear. How will the cameras and sensors track lane markings if the markings are obscured by water, oil, ice or debris?

Traffic Conditions and Laws

Will autonomous cars have trouble in tunnels or on bridges? How will they do in bumper-to-bumper traffic? Will autonomous cars be relegated to a specific lane? Will they be granted carpool lane access? And what about the fleet of legacy cars still sharing the roadways for the next 20 or 30 years?

Accident Liability

Who is liable for accidents caused by an autonomous car? The manufacturer? The human passenger? The latest blueprints suggest that a fully autonomous Level 5 car will not have a dashboard or a steering wheel, so a human passenger would not even have the option to take control of the vehicle in an emergency.

© Cambridge OCR 2027

Artificial vs. Emotional Intelligence

Human drivers rely on subtle cues and non-verbal communication, like making eye contact with pedestrians, or reading the facial expressions and body language of other drivers to make split-second judgment calls and predict behaviours. Will autonomous cars be able to replicate this connection? Will they have the same life-saving instincts as human drivers?

[8] https://www.synopsys.com/glossary/what-is-autonomous-car.html#1

© Cambridge OCR 2027

Research notes:

© Cambridge OCR 2027

Research notes:

© Cambridge OCR 2027

Research notes:

CAMBRIDGE
OCR

Copyright Information

Cambridge OCR is committed to securing permission to reproduce all third-party content that it uses in its assessment materials. If Cambridge OCR has unwittingly failed to correctly acknowledge or clear any third-party content in this assessment material, Cambridge OCR will be happy to correct its mistake at the earliest possible opportunity. To avoid the issue of disclosure of answer-related information to candidates, all copyright acknowledgements are reproduced in the Cambridge OCR Copyright Acknowledgements Booklet. This is produced for each series of examinations and is freely available to download from our public website (www.ocr.org.uk) after the live examination series.

For queries or further information please contact The Cambridge OCR Copyright Team, The Triangle Building, Shaftesbury Road, Cambridge CB2 8EA.

Cambridge OCR is part of Cambridge University Press & Assessment, which is itself a department of the University of Cambridge.

© Cambridge OCR 2027