1.

a. I would propose a solution that takes inspiration in Uber/Lyft's business model of crowdsourcing average citizens with reasonable vehicles and a smartphone to help do the work for me. This could help alleviate UPS driver workloads for dealing with smaller hand-deliverables, such as smaller Amazon packages. I'm sure there might be privacy concerns among some end-users, but it could be opt-in until it works.

   Additionally, there could be different levels of participation. If everyone commuting to and from work could bring a few parcels from their local post office or UPS depot to their final destination on the way, they still have to make the trip to work and it could reduce unnecessary overhead in greenhouse emissions.

b. UPS already have their On-Road Integrated Optimization Navigation (ORION) system for their fleet as well as drones. My solution from a) would require the drivers to have smartphones with GPS support.

   An app would leverage the smartphones of drivers and the existing UPS ORION system to generate a reasonable order of delivery for the driver. The smartphone reports back to UPS the location of the driver as well as which package they're delivering.

   Existing UPS trucks could use the same system by installing GPS modules on the cars themselves, removing the need for a separate smartphone.

c. My role as Chief Information Officer (CIO) within UPS would traditionally be to keep things running for the company's IT infrastructure. More specifically, to deploy and maintain the technology required to support the company's business operations. This can include activities such as carrying out digitalization plans settled on by other management, making sure information spreads effortlessly through the company structure to those who need it (ensuring other executives are kept up to date on what's going on, for example) as well as help ensure the company doesn't settle for what it already has, but keeps its eyes set on the horizon and ready to embrace new emerging technologies. (Some companies might put this last one on the CDO but I include it because many companies include it in the CIO's duties)

d. If my business had a skill gap in what it requires to implement my solution, I would look for external expertise to assist the transformation process. The goal would be to best integrate new functionality with the old, so that ORION doesn't go to waste. I believe it would benefit the implementation of the solution to get in a consultant or a team of consultants who have worked on Uber or Lyft's systems. They could integrate with existing teams and help avoid the pitfalls of a crowdsourced solution.

e. I believe it could positively impact several of the sustainability SDGs, most specifically 11 (sustainable cities and communities) if the selective opt-in was done well. Using the vehicles of those who travel anyway to allow them to earn a little bit of extra money while making sure the vehicle is used for a secondary purpose that a larger delivery vehicle now doesn't have to do is environmentally friendly to me. More so with the prevalence of Hybrid or Electric Vehicles(EV) among the private populace and the challenge of transforming the heavy transport sector to EV.

2.

a. A digital solution to help students collaboratively run lab experiments could possibly be implemented with the use of the ability to remote-interface with a robot in the laboratory and give sensory feedback to the user through the tools they use.
b. A solution that can monitor students' activities during home exams could include the use of visual analysis together with screen recording technology. It could be trained to detect the presence of common communication software and take screenshots at the time of detection, which would allow the school employees overseeing the exam to review suspicious behavior. A concern might be privacy laws, but in-person school exams allow for the employees to wander around looking at screens anyway, so maybe that can be resolved.
c. For a)
   They could use collaborative robots (cobots) with virtual reality (VR). As a lab requires a physical element, at first this might involve shared use of one cobot by allowing students to take turns or for a moderator to pass the controls around. The implementation to allow students to touch and feel could involve the use of a VR system with haptic feedback in a glove. Perhaps when the cobot grabs a component it gives immediate feedback when the item is fully grasped. And depending on the level of abstraction desired this could simply lock the trigger button the students use to control the level of "hand contraction" around the appropriate size of the object. This could be extended to a more advanced system with multiple actuators and full hand simulation where the cobot or sensors in the lab get the dimensions of an item using imaging technology and provide a 3D mesh of the object. This would require a more advanced hand/touch interface for the students but is not outside the realm of possibility.

   For b)
   They could use regular screen recording software together with a neural network trained to detect common communication software. The model can be trained to allow a computer to detect and flag specific software and user behaviors that the system then takes screenshots of and saves.

   Perhaps to get around privacy issues, all these pictures and data can be stored locally at first, but a signal is sent to the examination tool that the user must agree to submit their private data due to suspicious behavior. This way, the student must opt in, and anyone who hasn't cheated will likely want to submit their exam and get a grade.

   This doesn't address the possibility of using phones, but I will admit that one is beyond me.
d. For the challenges in online learning, I look at a couple of SDGs. Namely 4 – Quality Education and 10 – Reduced Inequalities.
   Since the goal is to redefine how we accomplish education to facilitate the best outcome in an online environment, the necessary infrastructure and tools need to be in place to ensure a quality education. If we look at figure 6.6 on page 245 of Industrial Digital Transformation, we can see that the journey from substitution to redefinition is full of ways to leverage technology, but this can be a challenge in poorer countries or districts that can't afford to adapt to these new methods.

Assuming online education can reach the same quality as classroom education, the hurdle is then to proliferate the redefined stage of online education, which requires connectivity as well as access to a computer with the required tools to make use of the new paradigm. This translates to requiring stable and sufficiently fast internet, as well as a device ideally equipped with a camera and microphone to allow participants to make use of the video conference portion of modern online education.

e. I believe my solution for 2a would positively impact SDG 3, 4 and 10, as mentioned in my answer for 2d. Good health (3) because it would allow students to carry out experiments while sick while not being in proximity to each other, thus reducing risk of infection. Quality education (4) because in addition to what they do in the lab, the students are exposed to emerging technology that makes them better equipped to handle similar situations in the future. And finally, Reduced Inequalities (10) because remote access to a lab would allow more people to participate in exercises that they might not have access to at their local school, since labs are not a given everywhere.

3.

a. A clever online platform could also be developed for use in diagnosis if the patient is well enough to participate, which could help free up doctor time.
b. The online diagnosis assist should be deployed using cloud technology, using the private cloud model. This would allow patients to use it without needing proprietary or clunky software, just a web browser.

   It could ask a patient a series of questions their doctor is likely to ask them, which could be presented to the doctor at the time of their appointment through the hospital's computer system because the information from the survey could be linked to the patient journal.

   For certain patients this could perhaps be extended to an active logging effort, such as the ability to log in and write when symptoms began occurring and track the development of the disease. The details of this can often get be forgotten.

   With enough sophistication and devices like smartwatches, we might even be able to enable apps that automatically log abnormalities in heartbeat, body temperature and behavioral patterns to this log, which could be further used to speed up diagnosis and allow doctors to manage additional patients.
c. Advantages of implementing the diagnosis solution on the cloud is as mentioned before, the barrier of entry is very low for patients. They would just require a web browser and whatever credentials they require to log in to the platform. The disadvantage could be potential data leaks and irresponsible handling of customer credentials leading to compromised private information. As is often the case in online systems security, the biggest weakness is the user.

   The four cloud models are as follows: public cloud, private cloud, hybrid cloud and multicloud.
d. It is possible to handle the first part of the solution relatively simply. Asking patients questions about their state of being is not high technology, it simply leverages asynchronous information gathering so that these questions have already been

asked by the time the doctor sees the patient.

For the more advanced logging features, it could be approached in partnership with smartwatch manufacturers who already provide a lot of this technology in their devices. Perhaps a lot of costs could be saved by leveraging existing data APIs and asking them to contribute to the work in exchange for being certified partners whose products are guaranteed to work within that country's healthcare ecosystem. The marketing might motivate the tech giants to carry a lot of the burden.

e. I believe the impacted SDGs are mainly: 3 – Good health and well-being and 8 – Decent work and economic growth.

   3 because it would help patients get higher quality treatment because of better medical documentation and proliferation of information about their ailment to the medical system.

   8 because improved health monitoring and early warning can help doctors feel they are keeping people healthy, which would be a part of decent work. Prevention is said to be a lot better than a cure, after all.

4.

a. Defensive strategies are about retaining your market position and reducing risk of losing ground to others. An example of a defensive strategy can be traditional car manufacturers making electric vehicles despite losing money on it. As battery and EV-tech improves in the future, costs will go down, which helps them justify their current position by pre-emptively adapting for the future.

   Offensive strategies are about disrupting the current market, often with new technologies or divergences from the old ways. Tesla is an example of employing an offensive strategy. They charge a price premium by being the perceived industry leaders in EV-tech, but they also do their utmost to implement emerging technology throughout their value chain.
   For example, over-the-air (OTA) updates to the vehicles allow them to push software updates to existing vehicles to fine tune and improve a customer's vehicle. They stay connected to the car and create a car's digital twin to give them a digital representation of the physical object. The digital twin lets them monitor and tweak the performance of a vehicle. This concept extends to the digital thread, which keeps track of the extended supply-chain of the vehicle assembly.
   Tesla also pushes heavily on autonomous driving, which has yet to fully come to fruition, but it has led to robust driver-assistance tools that promote road safety and driver comfort.
   All these things contribute to Tesla contributing to revolutionizing the car manufacturing industry, paving the way for more non-traditional manufacturers to find a foothold. Figure 4.3 on page 146 of the Industrial Digital Transformation shows the growing disparity in revenue share and split for the auto industry.

b. Responses to COVID-19 have included rapid increase of home office solutions as well as making spreading of information to the public necessary on a scale not seen before.

   To adapt to stricter quarantining measures but needing daily business operations to carry on as undisturbed as possible, both the private and public sector had to do as much as possible to allow their employees to work from home so they could observe social distancing rules. This led to a huge uptick of video conferencing software such as Zoom, Teams and others to let colleagues stay in touch with each other. This in turn required employees to have capable home offices, which drove a lot of hardware sales during the pandemic. It is safe to say the average home is better equipped for digital technologies in the wake of the pandemic to cope with all the new requirements of working through social distancing.

   For the spreading of information, we saw the emergence of phone apps that tied to your personal ID that would exchange handshakes with other nearby phones and keep track of who you've been around with the same app. If you then tested positive for COVID-19 you would report this in the app. The app would notify everyone you'd been in proximity to that someone they've been near to tested positive. This is a very clever way to track the pandemic's spread and could be applied to similar situations in the future.

   We've also seen the development of systems that monitor crowd densities to maintain social distancing or read temperatures of people in public. The systems can help remind people nearby to maintain social distance or perhaps notify health workers at a checkpoint that someone has an elevated temperature and should be kept away from others and tested.

c. (I am assuming technical debt and not debit)
   Technical debt is the concept of incurring design flaws you later must resolve by resorting to a quick and easy solution for the earlier stages of a project. An example can be creating an application without keeping in mind the accepted standards and practices and ending up struggling with extending the old system because everything is tightly coupled and heavily dependent on concrete implementations.

   It is better to address it earlier rather than later, because building on technical debt is a sure way to make a bad situation worse if your requirements change again later.

d. Some of the leading indicators can be struggling to complete the transformation; needing to restart or rethink it following it failing to achieve the projected business value for the company.

   This can stem from many factors, but a couple of examples could be ignoring your company's culture in favor of only looking at technologies or trying to undertake a highly ambitious transformation with limited resources (funds or perhaps qualified personnel).

e. Lights-out manufacturing is the capacity to run an industrial manufacturing site without active personnel on site. As the name implies, lighting the facility would be an inefficiency; the machines don't need light to do the work.

Industrial digital transformation is driving lights-out manufacturing by allowing entire facilities to be automated through digitization. This is done by implementing automated material handling systems and scheduling, which delivers the required materials to each step of the fabrication process. In more modern facilities, the entire factory floor is represented by a digital twin using IoT sensor data. Allowing systems to be aware of the state of the production line through digitization allows the complete automation and removal of human workers from the factory floor.

There is a lot that can be said about the specifics of lights-out manufacturing, but a move towards industry standards also contributes to this, as machines are perfectly capable of handling standardized components during manufacture.