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NATIONAL SENIOR CERTIFICATE EXAMINATION
2024

**LIFE ORIENTATION
COMMON ASSESSMENT TASK: PART A
EDUCATOR'S MANUAL**

Dear LO Educator

Thank you for your continued commitment to this subject, despite there sometimes being difficulties in getting the needed resources and validation. Life Orientation is an incredibly powerful subject, which can spark conversations with learners about topics not traditionally discussed in a classroom. It can encourage critical thinking, problem-solving, and empathy, and allow learners to see things from multiple perspectives; to step out of their 'bubble', even if temporarily, and encounter a wider world.

And technology is changing the landscape of our world at a rapid pace. We are in the throes of the Fourth Industrial Revolution (Industry 4.0) and professionals are already talking about the impact that Industry 5.0 will have on how we live.

If we look at the previous Industrial Revolutions, we notice that each event had a profound impact on how people lived, worked, and interacted with our world. The major difference between Industry 4.0 and previous revolutions is the scale and speed with which things are changing. It is no longer a slow process, occurring over a century, but fast-paced and changing dramatically within the space of a few short years.

Professionals have indicated that the World of Work is changing at such a rapid pace that it is not possible to predict, with certainty, what it will look like in as little as 10 years. If we cannot predict it, how can we prepare for it? And surely our role as educators is to help prepare our learners to be engaged, productive, and successful members of the future workforce? But how can we endeavour to do that if even the professionals in the know are at a loss as to what to prepare for?

And this is the beauty of the LO lesson. Throughout the CAT A and CAT B, learners will have the opportunity to explore the concept of an 'Industrial Revolution'. They will have a look at previous Industrial Revolutions and how they changed the world, as well as the lessons to be gained from these previous Industrial Revolutions. The emerging technologies in Industry 4.0 will be looked at, as well as ethics related to the use of those technologies. And lastly, the all-important topic of how to prepare for this fast-changing world will be looked at, with a glimpse of Industry 5.0.

One important attitude to aim to instil in our learners is that of 'the desire to work towards ending inequality'. There are many different levels and kinds of inequality, and the concept of technology and access to it is one of them. While our future, and the prospect of emerging technologies in it are exciting, we need to try and ensure that everyone is welcome and has the same opportunities to access them. And yes, this is not an easy 'utopia' to accomplish, but if we do not acknowledge these inequalities, and work towards ending them, this utopia will most definitely never be reached.

Please approach this CAT with visible positivity and take your learners on this journey with excitement, believing it has the potential to empower them to confidently enter the daunting unknown. We want our learners to realise that it is not just up to their parents, schools, and tertiary institutions to prepare them for their future, but rather, it is also up to them to take agency, develop the skills needed, and create the world in which they want to live. When young people play an active role in their development and their world, great things can happen.

INDUSTRY 4.0: WHERE TO FROM HERE?



[<<https://www.forbes.com/sites/bernardmarr/2018/09/02/what-is-industry-4-0-heres-a-super-easy-explanation-for-anyone/?sh=7f64be0a9788>>, accessed 24/11/2023]

'We stand on the brink of a technological revolution that will fundamentally alter the way we live, work, and relate to one another. In its scale, scope, and complexity, the transformation will be unlike anything humankind has experienced before. We do not yet know just how it will unfold, but one thing is clear: the response to it must be integrated and comprehensive, involving all stakeholders of the global polity, from the public and private sectors to academia and civil society.'

[Schwab, K. (2016) The Fourth Industrial Revolution: What It Means and how to respond, World Economic Forum. Available at: <https://www.weforum.org/agenda/2016/01/the-fourth-industrial-revolution-what-it-means-and-how-to-respond/> (Accessed: 16 October 2023).]

Each previous Industrial Revolution fundamentally changed how we, as humans, lived, worked, and interacted with our world. With the rapid advancements in technology, we are currently experiencing in 'Industry 4.0' (Fourth Industrial Revolution), it is safe to say that many people are asking, 'Where to from here?'

'We are currently preparing students for jobs that don't yet exist ... using technologies that haven't been invented ... in order to solve problems we don't even know are problems yet.'

-Gunderson et al

[Gunderson, S., Jones, R. & Scanland, K. 2004. The Jobs Revolution: Changing How America Works. Copywriters Inc.]

AIMS OF THE 2024 CAT

The 2024 Common Assessment Task will require you to explore the concept of the Industrial Revolution. You will need to understand the previous Industrial Revolutions and the changes they brought to the world at that time. The technologies of Industry 4.0 will be explored in-depth, as well as give you a glimpse into the emerging Industry 5.0. Arising from this understanding, you will be required to explore the knowledge, skills, values, and attitudes required to be successful in a future World of Work, which is yet to be defined.

The CAT will explore the following:

- Previous Industrial Revolutions and their impact on our current way of life.
- How Industry 4.0 is changing and shaping our world.
- What the emerging Industry 5.0 is.
- The knowledge, skills, values, and attitudes which will ensure success in this rapidly changing landscape.
- Areas of concern with regard to emerging technologies.
- The need for current systems, or ways of living to be revolutionised to fit better into our changing world, and what this might look like.

NB: ASSESSMENT REQUIREMENTS

Questions 3 (20 marks) and 4 (60 marks) are compulsory questions for assessment.

Please work through Question 1 and Question 2 with your classmates and educator and take careful note of the comments and observations made. These will give you insight into the multiple perspectives of each contextual source that you may not have previously considered. This will aid you in providing quality responses in the CAT A and B.

Regarding your responses in both CAT A and CAT B – please ensure that you provide sufficient detail in your answers. You are required to think deeply about each question and to ensure that your opinions and thoughts are supported by valid reasoning.



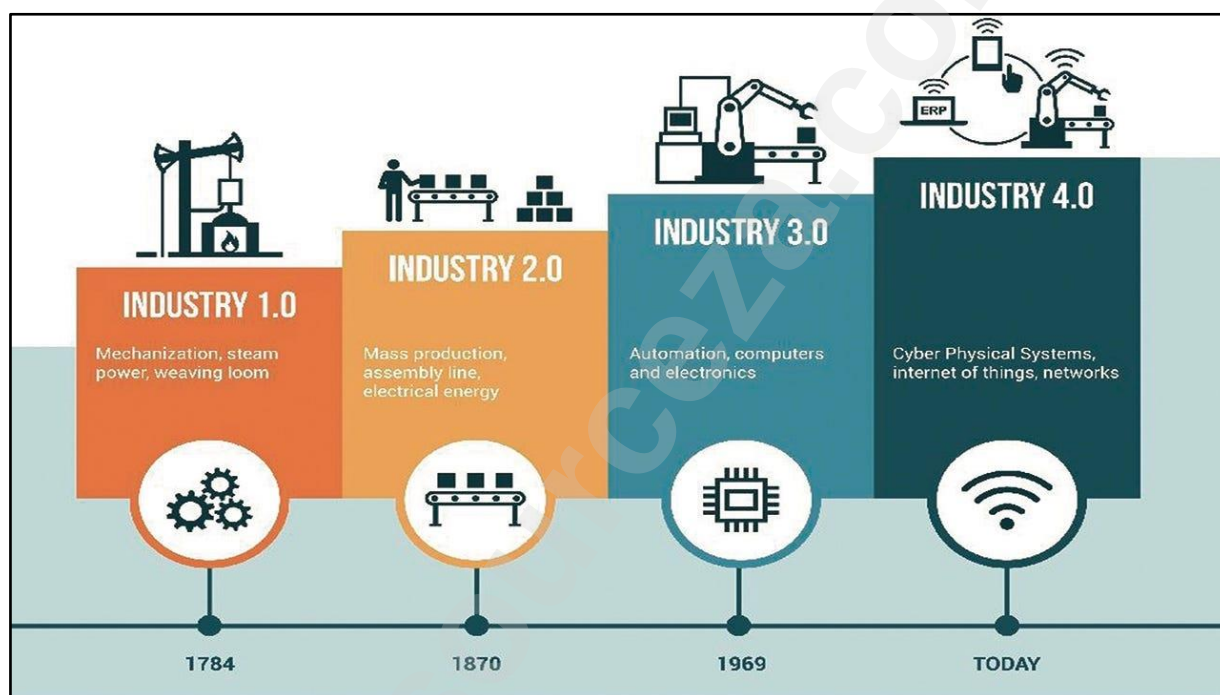
[Source: Sinha, A. (2023) *Exploring the integration of cloud-based machine learning with Edge Devices*, *TimesTech*. Available at: <https://timestech.in/exploring-the-integration-of-cloud-based-machine-learning-with-edge-devices/> (Accessed: 27 December 2023).]

QUESTION 1**PREVIOUS INDUSTRIAL REVOLUTIONS**

AIM: To explore the previous Industrial Revolutions and how they impacted how we live, work, and interact with our world.

Question 1.1 – A brief exploration of the 4 Industrial Revolutions

Look at the following infographic and watch the video clip indicated below and then complete the activity that follows.

The Four Industrial Revolutions at a Glance

[Source: Velliur, M. (2019) *The Fourth Industrial Revolution is here - what makes it different?*, Medium. Available at: <https://medium.com/@vmahesh/the-fourth-industrial-revolution-is-here-what-makes-it-different-8264720e88a2> (Accessed: 08 December 2023).]

Watch

The Four Industrial Revolutions Explained In Under 4 Minutes! (4,00 mins):

[<<https://www.youtube.com/watch?v=NDTvCO5ifKo>>]

CLASS DISCUSSION

Each Industrial Revolution changed society and the skills required for the workplace. Consider the following:

- Why would it be important to understand the past and look forward to the future to ensure you are prepared for the emerging world of work?

History repeats itself and it is therefore important to understand how the previous Industrial Revolutions changed the world of work in terms of how work was completed and the change in skills needed to be relevant in the new workforce. We can take these lessons forward and ensure that we actively keep up with how

the world of work is changing and what must be focused on to ensure success in the emerging world of work.

- The video clip mentions Industry 5.0, which is expected to focus on the human aspect of work. It is set to create an environment where creativity, critical thinking, and social intelligence are the main skills needed to be successful. Why would these three skills be essential?
 - ***Creativity will help learners problem-solve, innovate, and create new solutions for the emerging world of work.***
 - ***Critical thinking allows you to connect ideas, evaluate arguments, find errors, and solve complex issues.***
 - ***Social intelligence is important because working with people will never go away. In fact, with technology replacing humans on automatic, mundane tasks, the human element such as coaching, management and psychology of work will become more important spheres for people to work in.***
- What is your opinion on the idea of Industry 5.0 and the changes it might bring?

Allow for learner response.

Question 1.2 – How Industrial Revolutions changed the world

Industrial Revolution Definition: History, Pros, and Cons

What Was the Industrial Revolution?

The Industrial Revolution was a period of major mechanisation* and innovation*. It began in Great Britain during the mid-18th century and early 19th century. It later spread throughout much of the world. This time saw the mechanisation of agriculture and manufacturing, and the introduction of new modes of transportation such as steamships, the automobile, and airplanes.

How Did the Industrial Revolution Affect Society?

The Industrial Revolution occurred 200 years ago, and it had a huge impact on how people lived and the way businesses operated. The factory systems developed during the Industrial Revolution are responsible for creating capitalism* and the modern cities of today.

Before this period, most households made their living farming and mainly lived in small, rural communities. When factories were built during the 18th century, people began working for companies located in urban areas for the first time. Often the wages were low, and conditions were harsh. However, working for such businesses still paid a better living wage than farming.

Production became more efficient during the Industrial Revolution because of inventions such as the steam engine. The steam engine dramatically reduced the time it took to manufacture products. The prices of products were lowered due to more efficient production. This was due to lower labour costs. This opened the marketing doors to a new level of customers.

What Were the Effects of the Industrial Revolution on Taxes?

The Industrial Revolution did not always develop naturally. The United States government, for example, helped domestic industry at the time by creating taxes on foreign imported goods. This was so that products like steel made by U.S. companies were cheaper than foreign imports. The development of infrastructure* such as railroads and bridges were due to cheaper steel prices.

Advantages of Industrialisation

The Industrial Revolution created an increase in employment opportunities. Wages at factories were higher than what people were making as farmers. Factories became more common. Therefore, more managers and employees were needed to operate the factories. This increased the supply of jobs and overall wages.

Populations migrated to urban areas searching for jobs because most of the factories and large companies were located near cities. There was often not enough housing to accommodate all the people moving into the cities. This led to improvements in city planning.

Increased innovation also led to higher levels of education. This often resulted in many ground-breaking inventions still used today. These inventions include the sewing machine, X-ray, lightbulb, calculator, and anaesthesia.

The following was invented due to advancements during the Industrial Revolution: the first combustible engine, the incandescent light bulb, and the modern assembly line used in manufacturing. The Industrial Revolution changed how people worked, the technologies available to them, and where they lived. It made life comfortable for many. However, living conditions for workers remained terrible. This eventually led to the rise of labour unions that led to improved working conditions and fair wages.

Disadvantages of Industrialisation

Although there were many advancements during the Industrial Revolution, rapid progress caused many issues. Workers left their farms to work in factories for higher wages and this led to a shortage of food production.

The sharp increase in the number of factories caused an increase in urban pollution. Sewage flowed in the streets in some cities and manufacturers dumped waste from factories into rivers. Water supplies were not tested and protected as they are today. As a result, regulations, and laws were created to protect the environment.

The Industrial Revolution provided an opportunity to increase profits. As a result, working conditions in factories worsened. Long hours, inadequate wages, and minimal breaks became the norm. Child labour was a significant issue. Health issues arose for many of the factory workers which led to labour strikes and the development of modern labour law.

[Adapted from: Chen, J. (2023) *Industrial revolution definition: History, Pros, and cons*, Investopedia. Available at: <https://www.investopedia.com/terms/i/industrial-revolution.asp> (Accessed: 08 December 2023).]

Glossary

Mechanisation: the introduction of machines or automatic devices into a process, activity, or place.

Innovation: the action or process of creating a new method, product, or idea.

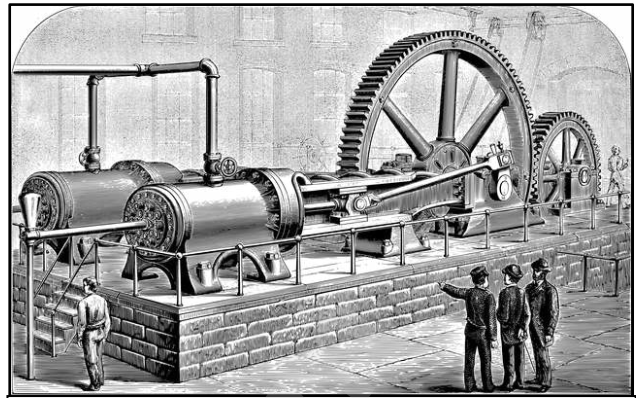
Capitalism: an economic and political system in which a country's trade and industry are controlled by private owners for profit.

Infrastructure: the basic physical and organizational structures and facilities (e.g. buildings, roads, power supplies) needed for the operation of a society or enterprise.

CLASS DISCUSSION

- 1.2.1 What from this passage stood out to you as the most interesting development due to the Industrial Revolution? Discuss this with your class and indicate why you found this / these item(s) interesting.

Learner dependent. Allow for a free-flow of ideas. Discuss why they find each development interesting and try to relate the conversation to its impact on our current world.



Faiz, M. (2023) The First Industrial Revolution and advancement in Modern World, Home -. Available at: <https://scientiamag.org/the-first-industrial-revolution-and-advancement-in-modern-world/> (Accessed: 28 December 2023).

1.2.2 – 1.2.4: Brainstorm the following questions as a class before providing the answers. This list is not exhaustive – therefore encourage a wide range of responses here.

- 1.2.2 What are the economic advantages and disadvantages of the Industrial Revolution?

Advantages

- ***More jobs were created***
- ***Workers received higher wages***
- ***Prices of products were lowered due to increased efficiency***
- ***Profits increased***

Disadvantages

- ***Lots of people lost their jobs and had to upskill/retrain***
- ***Taxes were introduced***

- 1.2.3 What are the social advantages and disadvantages of the Industrial Revolution?

Advantages

- ***Urbanisation***
- ***Improved standard of living for a large portion of the population***
- ***The development of labour unions, and modern labour law was instituted***
- ***Greater accessibility to technologies, which improved living***
- ***Improvements in city planning and housing***
- ***Higher levels of education***
- ***Improved infrastructure***

Disadvantages

- ***Urbanisation***
- ***Terrible working conditions in factories – exploitation.***
- ***Child labour***
- ***Food shortages***
- ***Family displacement***
- ***Capitalism and the inequality that comes with it.***

1.2.4 What are the **environmental** advantages and disadvantages of the Industrial Revolution?

Advantages

- ***Better housing***
- ***Environmental regulations***
- ***Better transport therefore better access to the world***

Disadvantages

- ***Large-scale pollution by people due to urbanisation***
- ***Factory and manufacturing pollution***
- ***Current pollution levels and global warming problems stem from this period***

Question 1.3 – Lessons learned from previous Industrial Revolutions.

Watch

The Impact of the Industrial Revolution (3,42 mins):

[<<https://www.youtube.com/watch?v=hv2JdhMc144>>]

1.3.1 What were the main influences on people and society due to the Industrial Revolution?

People used to live in rural areas. They then moved into the cities in search of work. This led to urbanisation and capitalism, which gave power to business owners. It gave investors and inventors the ability to make a lot of money, without governmental influence. This allowed workers to be exploited due to harsh working conditions and little pay, which led to the formation of labour unions. This ensured better wages and working conditions. Infrastructure such as train and water transport were established to move goods. This was later repurposed for public transport. There was also increased pollution due to people moving to the cities, as well as from factories and the production of goods. Global warming and climate change are the legacy of this. Women worked in factories and coal mines. They were poorly paid and not allowed to vote. This gave rise to the feminism movement which led to more equal rights for women.

1.3.2 What can we learn from previous Industrial Revolutions?

Allow the class to brainstorm ideas.

We can learn that there are many changes brought about by each Industrial Revolution and the changes are not limited to the world of work. Society as a whole changes. Often the change is negative in the beginning, but ultimately it leads to the betterment of people and their lives. We therefore need to be aware that Industry 4.0 will bring changes to our lives, as can be seen in the technologies that we already use on a day-to-day basis. There might be a period when things worsen, but if people are prepared to take a stand, then things will improve.

1.3.3 How can we use these lessons to positively impact the future?

Allow the class to brainstorm ideas.

We need to look for responsible ways to use these technologies, and ensure that how we use these technologies does not harm people or the environment. We can actively ensure that policies are created to safeguard all people, not just those with the means to protect themselves. We must ensure that the benefits that technology provides are accessible to all people, and that no one is left behind.

Question 1.4 – How Industrial Revolutions impacted the job market.

How Learning from Past Industrial Revolutions Creates An Optimistic View Of Industry 4.0

Everywhere you look today there is a new headline about Industry 4.0 – the Fourth Industrial Revolution – filled with buzzwords like 'Big Data.' The main worry is that new technology, such as artificial intelligence (AI), will wipe out most jobs in the near future. Future innovations and their impact on industry are still uncertain. However, we may best prepare for the effects of the fourth industrial revolution by looking back on the first, second and third Industrial Revolutions.

Industry 1.0: 1700s To Mid-1800s

The First Industrial Revolution changed our economy from agriculture to industry. This led to mass production. There was therefore more supply which could meet increasing consumer demand. Mechanisation made manufacturing possible for the first time. This meant a huge increase in workers' productivity.

During this time, people panicked that they would lose their jobs to machines. Yes, new inventions did reduce the number of people needed to create goods by hand. But mechanical manufacturing also led to new professions. For example, technicians* were now needed to build and maintain manufacturing equipment.

Industry 2.0: 1800s To Mid-1900s

The Second Industrial Revolution was about the discovery of electricity, gas and oil. The invention of the combustion engine also used these energy sources. This allowed for steel and chemical products to enter the market. The transportation industry drastically changed with the invention of aircraft and automobiles. The speed of communication sharply increased with the invention of the telephone.

As before, people panicked. Newspapers had scary headlines such as 'MARCH OF THE MACHINES MAKES IDLE HANDS.' As before, many jobs were made unnecessary. These professions are now so old-fashioned that many people living today have never heard of them. For example, in the mid-1800s, doctors believed that bloodletting could cure disease. There were professional leech collectors who were responsible for collecting the blood-sucking insects from nature. They often used their own bodies as bait.

Industry 3.0: Mid To Late 1900s

The Third Industrial Revolution was started by the discovery of nuclear energy and electronics. There was a focus on making industrial jobs safer. This led to advancements in technology. High-level automation led to a new focus on improving manufacturing processes.

The birth of computers and the internet changed the way people worked and communicated with each other. Manufacturing and automation continued to advance with the help of connectivity and renewable energy. Many people working during the Third Industrial Revolution

were convinced that computers would be the machines that finally put them out of a job. However, even though information technology was widely used, it still relied on human input.

[Source: Chauhan, N. (2022) Wind River Brand. The power of xaas in manufacturing: New business models boost productivity and generate recurring revenues, Forbes. Available at: <https://www.forbes.com/site/windriver/2022/08/02/the-power-of-xaas-in-manufacturing-new-business-models-boost-productivity-and-generate-recurring-revenues/?sh=1bc06a4b5a33> (Accessed: 28 December 2023).]



Industry 4.0: Today

The main technological transition between Industry 3.0 and 4.0 is the improvement of automation. This was due to internet connectivity that makes 'smart' technology. In manufacturing, more components are connected through the internet. As the Internet of Things (IoT), cloud technology and AI improves, the physical and virtual worlds will continue to meet. But will smart technology actually replace human insight? We know that the job market will look very different in as few as 10 years from now. Automation and digital platforms are changing the basic nature of work. Over the next decade, technology will increase efficiency*, organisation and productivity at an increasing rate.

Smart technology is creating more information than ever before. More information does not always mean better insights. Human insight will always be needed to ensure accuracy, especially when it comes to maintenance. Smart technology and IoT means fewer field technicians are doing manual work. But they will need more experienced technicians who can understand and analyse data related to specific equipment and processes.

If we look at Industry 4.0 through the lens of previous Industrial Revolutions, it's much easier to see that Big Data won't likely eliminate human work as much as it will elevate human work. The goal is to use smart technology to make maintenance jobs safer and more rewarding.

[Adapted from: Chan, R. (2023) *Council post: How learning from past Industrial Revolutions creates an optimistic view of industry 4.0*, Forbes. Available at: <https://www.forbes.com/sites/forbestechcouncil/2019/11/01/how-learning-from-past-industrial-revolutions-creates-an-optimistic-view-of-industry-4-0/> (Accessed: 08 December 2023).]

Glossary

Technician: a person employed to look after technical equipment.

Efficiency: the ability to achieve an end goal with little to no waste, effort, or energy

CLASS DISCUSSION

- 1.4.1 According to this passage, what are the main lessons that could be learned from the previous Industrial Revolutions that have a bearing on our current and / or future lives?

While there might be an initial drop in job opportunities, the Industrial Revolutions always create new career fields and job opportunities. It is essential for people to be able to reskill and retrain themselves to be able to remain employable.

****The important thing for learners to get out of this passage is that it is essential to adopt an attitude of lifelong learning to remain relevant. It is also essential to actively learn transferable skills to stay with the changes. This will be unpacked further in Question 2.***

- 1.4.2 Working in pairs, research what you believe the world of work will look like in 10 years from now. Feedback to the class.

Allow for learner response. The world of work is going to look different. AI is going to replace a lot of menial, data-inputting jobs. However, the new technologies will create new job opportunities. Allow learners to brainstorm and give their views on the changes.

Some ideas are as follows:

- ***Shorter work week with more flexibility***
- ***'Hot desking' where there are no assigned desks. An employee will book a workspace to work at when they are in the office***
- ***Traditional offices will fall away as people work more from home. Hybrid working will be more common and offices will mainly consist of meeting spaces, breakaway rooms and 'hot desks'***
- ***AI and technology will be used by most people at most levels of an organisation***
- ***Virtual Reality (VR) and virtual meet spaces will allow employees from different countries to meet in real-time and be 'present' in the same meeting room***
- ***There will be a higher emphasis on well-being, as well as being in a career that impacts the community in a positive way***
- ***Most routine jobs will be automated***

- 1.4.3 What are your biggest concerns regarding technology advancements? Explain your concerns to your class.

Allow for learner response. Obvious concerns are that the career they want to pursue might not be around in 10 years, or that they might not be trained for it properly. Maybe just the unknown concerns them. They could be concerned about how technology might change other aspects of their lives, not only their career options. 'Big Brother' might be a concern: Governments or other interested groups that use technology for nefarious purposes.

1.4.4 In what way do you feel prepared for the future world of work?

Allow for learner response. This will be very specific to each learner. Give them time to explain how they feel prepared for the future world of work.

1.4.5 In what way do you feel unprepared for the future world of work?

Allow for learner response. This will be very specific to each learner. Give them time to explain how they feel unprepared for the future world of work.

1.4.6 How do you think you could prepare yourself for the future?

Allow for learner response. This will be unpacked further in Question 2. Try and engage learners to understand that agency from their side is also required for them to stay relevant.

A few ideas:

- ***Research what trends will exist in the career fields that interest you***
- ***Lifelong learning and adaptability is important***
- ***Upskill yourself in digital skills according to the career field you are in***
- ***Attending virtual and live seminars to upskill***
- ***Develop effective verbal and written communication skills***
- ***Develop 'soft skills' such as critical thinking, collaboration, complex problem thinking, life skills, interpersonal skills***



[Source: Marcus Mossberger, H.S.D. (2023) The Future of Work: A new division of Labor, Training. Available at: <https://trainingmag.com/the-future-of-work-a-new-division-of-labor/> (Accessed: 28 December 2023).]

QUESTION 2**THE FOURTH INDUSTRIAL REVOLUTION**

AIM: To explore the Fourth Industrial Revolution (Industry 4.0) and how it is affecting the current world of work, as well as looking at what the future holds. To analyse the current changes in our world and look ahead to the skills needed to be successful in this rapidly changing landscape. A brief look at Industry 5.0.

Question 2.1 – Delving into Industry 4.0**Watch**

What is Industry 4.0? (2,46 mins)

[<<https://www.youtube.com/watch?v=we4h22VI5zl>>]

CLASS DISCUSSION

- What about the emerging technologies excites you the most? Explain why.
Allow for learner response. Encourage full explanations about what is exciting about emerging technologies.
- New technologies are said to change what it means to be human. Why do you think this is?
The capabilities of the emerging technologies are wide-reaching and profound. One technology, AI, can emulate human likeness to an extent where it is difficult to tell where the machine ends and the human begins.
- Technological progress requires people to make it happen. How could you best position yourself to be part of this progress?
Allow for learner response.
Some prompts:
 - **Keep up-to-date with all the new technological advancements**
 - **Research careers in the emerging technology fields and work towards those**
 - **Learn how to use emerging technologies**

Read the article below and answer the questions that follow:

The Fourth Industrial Revolution: What It Means and how to respond.

We are at the edge of a technological revolution that will change how we live, work, and connect with others. This change will be unlike anything humanity has experienced before. We don't know exactly how it will unfold, but one thing is certain: everyone around the world needs to work together to respond to it.

The First Industrial Revolution used water and steam to make production more efficient. The Second used electric power to create mass production. The Third used electronics and information technology to automate production. Now, the Fourth Industrial Revolution is building on the Third. It involves a mix of technologies that blur the lines between the physical, digital, and biological worlds.

Billions of people are already using mobile devices to connect. These devices will keep getting better with more processing power, storage, and access to information. The capabilities of these devices will be influenced by new breakthroughs in technology in fields like artificial intelligence, robotics, the Internet of Things, autonomous vehicles, 3-D printing, nanotechnology, biotechnology, materials science, energy storage, and quantum computing.

Challenges and opportunities

The Fourth Industrial Revolution, like the ones before it, can make the world richer and improve people's lives worldwide. Technology has created new products and services that make life better for those who can afford them. In the future, making things and getting work done will become more efficient, and it will cost less to transport and communicate. This will make the economy grow.

But, at the same time, the revolution might make inequality worse, especially because it can change how jobs work. Machines could take over many jobs, leaving a lot of people without work. This might make the gap between rich and poor even bigger. The ones who benefit the most from innovation are usually the ones who came up with them, as well as the people who own shares and invest money. This is why the difference in wealth is growing between those who have money (like investments) and those who work to earn a living. However, it could also lead to more jobs that are safer and more rewarding.

The impact on government

Governments will have more control over people using new technology, like watching them with surveillance and managing digital systems. But, as new technologies, like self-controlled or biological weapons, become simpler to use, regular people and small groups can cause big harm. This makes everyone more at risk, and it creates new worries. Governments will need good plans and rules to calm these worries. At the same time, better technology can also make violence less serious or not happen as much.

The impact on people

The Fourth Industrial Revolution will not only change what we do but also who we are. It will affect our identity and related issues like privacy, ownership, how we consume, the time we spend working and relaxing, and how we build our careers, develop skills, meet people, and nurture relationships.

Sometimes, I wonder if technology becoming a big part of our lives might make us lose some important human qualities, like compassion and cooperation. Our relationship with smartphones

is an example. Being connected all the time might take away one of the most valuable things in life: time to pause, think, and have meaningful conversations.

One big challenge with new technologies is privacy. We all know why it's important, but sharing and tracking information about us is a big part of the new connected world. Debates about important issues, like how losing control over our data affects our inner lives, will get stronger in the coming years. Also, the big changes happening in biotechnology and AI, which are redefining what it means to be human by pushing the limits of lifespan, health, thinking, and abilities, will force us to rethink our ethical and moral boundaries.

[Source: 3d, admin (2023) 6 uses of 3D printing in the medical and healthcare industry, onpoint3d. Available at: <<https://onpoint3d.com/uses-of-3d-printing-in-the-medical-and-healthcare-industry/>> (Accessed: 28 December 2023).]



Shaping the future

Neither technology nor the changes it brings are forces that happen on their own and that we can't control. All of us have a role in guiding how it develops, and we make decisions every day as citizens, consumers, and investors. We should recognise the chance and influence we have to shape the Fourth Industrial Revolution and guide it toward a future that represents what we all want and believe in.

But to do this, we need to understand together, on a global level, how technology is affecting our lives and changing our economic, social, cultural, and human surroundings. This is a time with a lot of promise, but also a time with potential dangers.

Ultimately, it's about people and values. We should create a future that benefits everyone by prioritising people and giving them the power. In its worst form, the Fourth Industrial Revolution might make humanity more like machines and take away our human qualities. But if we use it alongside the best parts of human nature—like creativity, empathy, and stewardship—it can help humanity reach a new understanding of what's right and wrong together. It's up to all of us to make sure that once the dust settles, the Fourth Industrial Revolution has left the world in a more positive place.

[Adapted from: [Schwab, K. (2016) *The Fourth Industrial Revolution: What It Means and how to respond*, *World Economic Forum*. Available at: <https://www.weforum.org/agenda/2016/01/the-fourth-industrial-revolution-what-it-means-and-how-to-respond/> (Accessed: 11 December 2023).]

2.1.1 Working with a partner, research, and document what the following technologies are:

- Artificial intelligence
- Robotics
- The Internet of Things
- Autonomous vehicles
- 3-D printing
- Nanotechnology
- Biotechnology
- Materials science
- Energy storage
- Quantum computing

Artificial intelligence: Artificial intelligence is the science of making machines that can think like humans. It can do things that are considered 'smart'. AI technology can process large amounts of data in ways in a short space of time, unlike humans. The goal for AI is to be able to do things such as recognise patterns, make decisions, and judge like humans.

Robotics: Robotics is a branch of engineering and computer science that involves the conception, design, manufacture, and operation of robots. The objective of the robotics field is to create intelligent machines that can assist humans in a variety of ways.

The Internet of Things: The term IoT, or Internet of Things, refers to the collective network of connected devices and the technology that facilitates communication between devices and the cloud, as well as between the devices themselves.

Autonomous vehicles: An autonomous car is a vehicle capable of sensing its environment and operating without human involvement. A human passenger is not required to take control of the vehicle at any time, nor is a human passenger required to be present in the vehicle at all.

3-D Printing: Three-dimensional (3D) printing is an additive manufacturing process that creates a physical object from a digital design. The process works by laying down thin layers of material in the form of liquid or powdered plastic, metal, or cement, and then fusing the layers.

Nanotechnology: Nanotechnology refers to the branch of science and engineering devoted to designing, producing, and using structures, devices, and systems by manipulating atoms and molecules at nanoscale, i.e. MICROSCOPIC.

Biotechnology: Biotechnology is the use of biology to develop new products, methods, and organisms intended to improve human health and society. Biotechnology, often referred to as biotech, has existed since the beginning of civilization with the domestication of plants, and animals and the discovery of fermentation.

Materials Science: It is a field of engineering which involves: (1) analysing the properties and structure of solid materials and (2) the discovery and design of new solid materials. It involves not only engineering but also other fields of science such as chemistry and physics.

Energy storage: Energy storage is the ability to capture energy at one time for use later. Storage devices can save energy in many forms (e.g., chemical, kinetic, or thermal) and convert them back to useful forms of energy like electricity.

Quantum computing: Quantum computing is a multidisciplinary field comprising aspects of computer science, physics, and mathematics that utilises quantum mechanics to solve complex problems faster than classical computers. Quantum mechanics is the field of physics that explains how extremely small objects simultaneously have the characteristics of both particles (tiny pieces of matter) and waves (a disturbance or variation that transfers energy).

2.1.2 On your own, or with a partner, research the different kinds of careers that could be involved in each of the above technologies. When considering possible careers, consider the following fields along the supply chain of each technological invention too:

- The invention of the technology
- The design of the technology
- The interaction between humans and the technology
- The creation, implementation, and regulation of policy surrounding the technology
- The selling/marketing the use of the technology

The list that can be generated is quite extensive. The main idea is for learners to realise that there are many different careers in these emerging fields and that they should try to think broadly and not limit their options. The world of work is going to look different in 10 years and learners need to ensure that they are relevant to have a successful career.

A few examples:

(NB – This list is by no means exhaustive and only indicates the tip of the iceberg. Your learners are encouraged to research in a career field they find interesting)

Artificial Intelligence

AI Ethicist: AI Ethicists ensure that AI systems are developed and used responsibly, addressing ethical concerns such as bias, privacy, and fairness.

AI Developer: AI Developers create and maintain AI models and algorithms, developing software and systems that leverage AI technologies.

AI Data Scientist: AI Data Scientists analyse complex datasets to extract valuable insights and inform AI model development.

AI Roboticist: AI Roboticists design and build robots and autonomous systems that incorporate AI for tasks like automation and autonomous navigation.

AI Business Strategist: AI Business Strategists identify opportunities for AI adoption within organizations and develop strategies for implementation.

AI Healthcare Specialist: AI Healthcare Specialists use AI to improve patient care, diagnose diseases, and develop healthcare solutions.

AI Human Resources (HR) Analyst: AI HR Analysts use AI tools and analytics to gather insights from employee data, helping HR departments make data-driven decisions related to recruitment, retention, and performance management.

Internet of Things

IoT Developer/Engineer: IoT developers and engineers design, develop, and implement IoT solutions. They work with hardware devices, embedded

systems, sensors, and connectivity protocols to create IoT applications and platforms.

IoT Security Specialist: With the proliferation of connected devices, IoT security has become a critical concern. IoT security specialists work on securing IoT systems, identifying vulnerabilities, implementing encryption protocols, and ensuring data privacy and integrity.

IoT Sales/Marketing: In the IoT sales and marketing domain, professionals promote and sell IoT products and services to businesses and consumers. They need to understand the technical aspects of IoT and effectively communicate the value proposition of IoT solutions to potential clients.

3D Printing

3D Printing Lawyer: To help navigate the complex world of Intellectual Property Rights.

3D Construction and Architecture: To print scale models of buildings before they are constructed. This replaces the traditional 2D drawing.

3D Design: Designing the items that are to be 3D printed. This career path could also relate to designing 3D equipment to fit into all spheres of life, not only business.

3D sales and administration roles: Various positions in the company to ensure the smooth running of the business.

3D Medicine: The possibility of using 3D-printed organs and tissues in human bodies will be realised in the next 10 years.

Nanotechnology

Food technologist: use nanotechniques to determine the safety and quality of a food product. Leads to the 3D printing of food.

Applications engineer: Using use nanotech solutions and arrangements to design and develop the product's properties.

Holography technicians: Using nanotechnology to create holographic equipment.

Law: Navigating the complex world of nanotechnology and the human rights infringements that could occur.

- 2.1.3 Reflect on whether any of the careers you researched above excite you as a potential career for you to follow and consider the possible reasons for this interest.

Allow for learner response. The learners should be encouraged to go beyond a simple yes/no response and give thought to where they could position themselves in the emerging world of work.

2.1.4 The article mentioned that one of the biggest challenges around the rapid innovations in technology is that the current levels of inequality are set to become wider. The article mentions that one of the main reasons is due to unskilled workers losing their jobs due to automation.

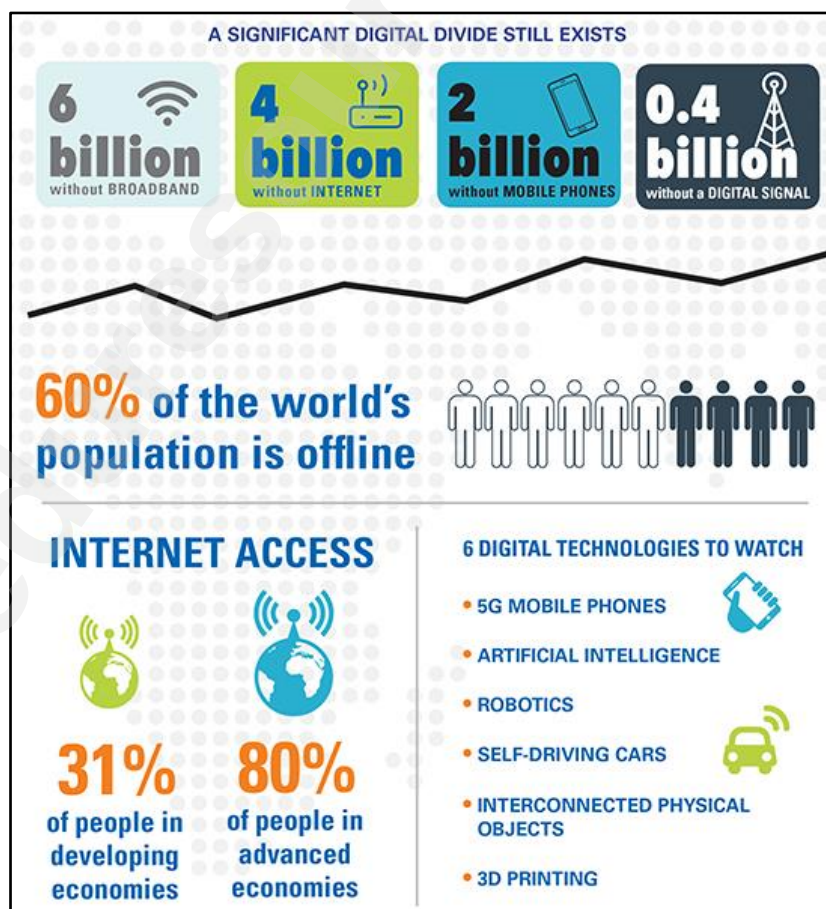
(a) To what extent do you think this is/will be true in South Africa?

This is quite a pertinent question to consider in the South African context due to a large proportion of the labour force in our country being unskilled. There are many hurdles which need to be overcome in our country:

- ***inadequate education for a vast majority of the population***
- ***the expense of technology which precludes a large portion of the population from being able to afford it***
- ***a forced ignorance where a portion of the population is not aware of emerging technologies due to a lack of exposure***
- ***the large portion of the population who is living below the breadline***

This will cause the large economic divide in our country to expand, as those who have the means to educate and upskill themselves in line with emerging technologies will be able to earn even more.

(b) Another cause of this inequality is the digital divide. Consider this divide and refer to the infographic below before answering the questions that follow.



Ramírez-Djumena, N. (2016) *Digital Divide, Digital Divide - Picture This-- Finance & Development, September 2016*. Available at: <https://www.imf.org/external/pubs/ft/fandd/2016/09/picture.htm> (Accessed: 11 December 2023).

- (i) What do you notice about the percentage of those with access to the Internet in developing economies compared with those in advanced economies?

Only 31% of those in developing economies have internet access, while 80% of people in advanced economies have internet access. There is a large discrepancy and people who live in developed nations have an advantage over people living in developing nations.

- (ii) Why do you think there is such a huge discrepancy in the percentage of people who have access to the Internet compared to those who don't?

There are a few reasons for this. It is a complex problem. A lot of it stems from a lack of infrastructure due to economic reasons. A lack of digital literacy means people do not understand why technology is important, or even that certain technology exists. Low literacy levels, low educational levels, as well as a struggling economy, also have an impact. There could also be a lack of support from government structures, which leads to widescale inequitable access to technologies.

- (iii) What impact would this inequality of access to digital technologies, as indicated on the right of the infographic, have on societies?

People and countries who do not have access to the internet or digital technologies would not be able to benefit from the positives that new technologies could bring. Not only that, but they will also not be able to upskill themselves to remain relevant in the job market, so they are at greater risk of losing their job or not being eligible for the job market at all.

- (iv) How do you propose that the governments of developing economies can ensure that their citizens are included in the advantages that Industry 4.0 brings, and minimise the impacts you mentioned in the previous question?

Digital skills build on other skills. Governments first need to address existing educational disadvantages before trying to close the digital divide.

The costs of technology and the internet in developing countries need to be moderated so that it can become more accessible to all citizens in the country.

More research and development of technology needs to occur in the country instead of only relying on incoming technology. Ensure there are opportunities for existing qualified individuals.

- 2.1.5 As explored in Question 1, each Industrial Revolution greatly impacted not only the world of work but also how people lived and interacted with the world.

Why do you think this article mentions that the Fourth Industrial Revolution will impact not only how we live, but also who we are?

The technology is developing so quickly, and due to the advancements, it is calling into question what it means to be human. This is because technologies such as AI and robotics could replace many 'human' activities and so we need to question who we are and what it means to be human if we wish to navigate successfully through these technological advancements. Technology could

also affect how we redefine ourselves – how we express ourselves, how (and if) we retain our individuality, how we use this technology.

2.1.6 Why, and, in what way, would we need to 'rethink our ethical and moral boundaries'?

Technology can be used to enhance our lives, but it also has the capacity for harm. From simple things, such as using AI to complete a project, to the capability of identity theft or privacy violations. There are many ways in which we might need to decide between what we feel is right or wrong and what we can accomplish or do with technology, for our benefit.

2.1.7 The article ends on a positive note, indicating that if used correctly, the emerging technologies can be used to benefit everyone. However, there is also a caution that we could lose our 'humanness'. Reflect on the following:

The following are more reflection-style questions but try to facilitate a class discussion around them as they will help learners gain insight into the pervasive nature of our current technology, without even looking at more advanced technologies.

- How much time do you spend with people around you, and without a device being present?

Allow for learner response.

- Do you find it easy to engage with people and give them your undivided attention? Provide reasons for your answer.

Allow for learner response.

- Creativity, empathy, and stewardship are highlighted as important human qualities to use in conjunction with technology to have the best outcome for all. Why are these important to preserve our 'humanness'?

Creativity will allow us to engage with and make use of technology in new and undiscovered ways. It can also allow us to come up with creative ways in which to use technology to benefit people.

Empathy is essential as it allows us access to other peoples' thoughts and viewpoints. This will allow us to use technology to benefit others, and not only ourselves. Technology can make our lives more insular and lead to a way of living that is isolated. It is therefore easy to slip into a 'must look after myself at the cost of others' mentality. Empathy will help us to look beyond ourselves and see the lives and experiences of others, which will keep us connected to other people.

Stewardship will allow us to take responsibility for the well-being of the world and those around us. In this, we realise that we are a global community and that it is up to everyone to ensure the well-being of people and the world. That we are all responsible for each other and the world, and that it is not only up to certain institutions to affect positive change.

Question 2.2 – The biggest concerns around The Fourth Industrial Revolution**Watch**

What is the Fourth Industrial Revolution? | CNBC Explains (4,17 mins)

[<<https://www.youtube.com/watch?v=v9rZOa3CUC8>>]

2.2.1 What are the six main concerns highlighted in this video clip?

There may be other concerns that learners found in the video clip. The options below are a condensed summary.

- ***Some governments are struggling to keep up with the changes***
- ***Innovators, investors, and shareholders benefit the most from innovation. This risks make inequality worse as the richest 1% of households already own 47% of global wealth***
- ***A 'winner-takes-all' economy where highly skilled workers take home all the pay and low-skilled workers are left out***
- ***Some careers will be eliminated, and even though new jobs will be created, many people will not have the right skills***
- ***Privacy concerns as companies are going digital and collecting data on customers. While this does enhance the shopping experience, people are concerned that companies know too much about their digital lives***
- ***Majority of leaders do not have the confidence that organisations are ready for the changes***

2.2.2 Do you share any of these concerns? Reflect on your feelings around these fears.

Allow for learner response.

2.2.3 How can we ensure we protect ourselves against the reality of these concerns in this fast-changing environment?

Allow for learner response. There are legitimate fears surrounding technology changes and while we need to ensure we are relevant in the emerging world, we also need to ensure that we are protected. This is where the ethics and morals discussed earlier come into play.

Question 2.3 – How to best prepare for the emerging world of work.

There has been a lot of discussion around the ethical use of AI, and tools such as ChatGPT, in education. Some of you might have used ChatGPT (whether ethically or not) in school tasks already.

- Do you have confidence in the information in the below source? Does the fact that it was written by ChatGPT make you believe it is more reliable or not? Explore your thoughts and feelings around this.

Facilitate a class discussion around this.

- Do you feel there is a difference (in ethical use) between using AI to help with school tasks and using it to create resources for educator use? Why or why not?

Facilitate a class discussion around this. Does your school have a policy in place with regard to the use of AI tools to help create teaching and learning resources?

- The current advancements in technology and the adoption of AI in everyday life mean that tools such as ChatGPT are going to be incorporated more and more into different spheres of life, with education being one of them. Brainstorm ways in which we can ensure that AI tools are used ethically, responsibly, and intelligently.

To address these challenges, it is necessary to develop ethical guidelines, ensure transparency, address bias and discrimination, protect privacy, and ensure accountability. One of the most important aspects to using AI ethically is to ensure that there is human oversight.



Read the passage below and reflect on the questions posed thereafter.

This passage was written by the OpenAI tool, ChatGPT 3.5. The prompts used have been indicated.

ChatGPT Prompt

Please write a passage approximately 300 words in length, detailing what skills Grade 12 learners need to have to be successful in the emerging world of work.

Please use active voice, simple sentences and ensure that the level of English is accessible to second-language English speakers.

ChatGPT Response

In the fast-changing job world, students in Grade 12 are getting ready for jobs that need different skills. Not just what they learn in school, but also a mix of different abilities.

Being good at adapting is super important. This means handling changes and learning new things fast, especially with technology. Being open to change helps students stay relevant in a world that keeps changing.

Another big thing is critical thinking and problem-solving. Employers really want people who can think well and find smart ways to solve problems. Grade 12 students should practice thinking this way, finding new and smart ways to solve challenges.

Written and verbal communication is also really important. Being able to explain ideas clearly, work well with different groups of people, and convince others with words are all really important. So, Grade 12 students should work on how they talk and write in our connected world.

Knowing how to use technology is a must in today's digital world. Grade 12 students should become good at using digital tools, basic coding, and data analysis. This helps open up many job opportunities.

Lastly, having emotional intelligence is a plus. This means understanding and managing your feelings, being able to relate to others, and dealing with social situations well. This skill is really helpful in workplaces where many different people work together.

In summary, Grade 12 students who want to do well in the changing job world should work on being good at adapting, thinking well, talking and writing effectively, understanding technology, and having emotional intelligence. Learning these skills will not only make them interesting to employers but also help them have a satisfying and strong career journey.

ChatGPT Prompt

How can learners cultivate the above skills?

ChatGPT Response**Adaptability**

Explore New Things: Be open to trying out different activities, like joining a club or picking up a new skill. The more you explore, the better you become at handling new situations.

Continuous Learning: Keep your curiosity alive! Read about various topics, and consider taking online courses. Learning never stops, and it keeps you ready for what's next.

Critical Thinking and Problem-Solving

Puzzle Time: Engage in activities that involve solving puzzles or brain teasers. These not only make your brain sharper but also enhance your ability to find smart solutions to challenges.

Ask Curious Questions: Challenge yourself to ask questions about the world around you. It's a great way to think critically and understand things better.

Communication Skills

Express Yourself: Join groups where you can talk in front of others. It could be a club or a friendly gathering. Speaking in public helps you express your thoughts with confidence.

Write Regularly: Develop a habit of writing regularly. It doesn't have to be long—short stories, a journal, or even a blog. Writing helps you communicate better on paper.

Technological Literacy

Online Learning: Enrol in online classes to explore digital tools, basic coding, and data analysis. Many websites offer affordable courses that make learning about technology accessible.

Hands-On Tech Projects: Apply what you learn by working on small tech projects. Build a simple website or use digital tools for a project. Practical experience goes a long way.

Emotional Intelligence

Reflect on Feelings: Take a moment to understand your own emotions. Reflecting on how you feel helps you develop self-awareness.

Consider Others: Try to understand how others feel. It makes it easier to connect with people and work well together.

Remember, the journey of learning is unique for everyone. Take small steps, be patient with yourself, and enjoy the process of growing your skills. If you ever need help, don't hesitate to ask for guidance from teachers, friends, or online communities. They are there to support you on your learning journey!

[Source: Open AI ChatGPT, 2023. ChatGPT Response to Wendy Charity. Available from: <https://chat.openai.com/c/98a773e1-4b59-4f9a-9b3c-82aea0c4539f> [Accessed 12 December 2023].

- 2.3.1 What stands out to you in the above passage concerning the skills needed to be successful in the emerging world of work?

Apart from technological literacy, all the skills that will ensure success in the new world of work are soft skills and are people-centred.

- 2.3.2 Why do you think emotional intelligence is an important skill to have when the world is becoming largely technology-driven?

Emotional intelligence remains relevant in technology-dominated workplaces because it complements and enhances the human aspects of work. It enables individuals to navigate the complexities of human relationships, communicate effectively, and contribute to a positive and supportive work culture, even in environments heavily influenced by technology. As technology advances, ethical considerations become increasingly important. Emotionally intelligent leaders can navigate ethical dilemmas with sensitivity, considering the impact of decisions on individuals and society.

- 2.3.3 Which of these skills do you believe schools are good at developing in young people? Explain why you think so.

Allow for learner response. Schools should, hopefully, be developing all of the above skills.

- 2.3.4 Reflect on your personal goals and progress in the development of these skills.

- (a) Which of the five abovementioned skills have you already developed?

Allow for learner response. Engage in conversation around why or how they have developed those skills.

- (b) Which of the five abovementioned skills do you feel you need to develop?

Allow for learner response. Engage in conversation around why or how they feel they need to develop those skills further.

- 2.3.5 Look at the recommendations made to improve the needed skills. Explore ways in which you can improve your skills. Be specific to **your** own school and home context.

Allow for learner response. Need to be specific to their own life and the opportunities they have to develop their skills.

Question 2.4 – Industry 5.0**Watch**

What is Industry 5.0? (2,30 mins)

[<<https://www.youtube.com/watch?v=QFH0H21PaJs>>]

- How can you actively create the future you want to be a part of?

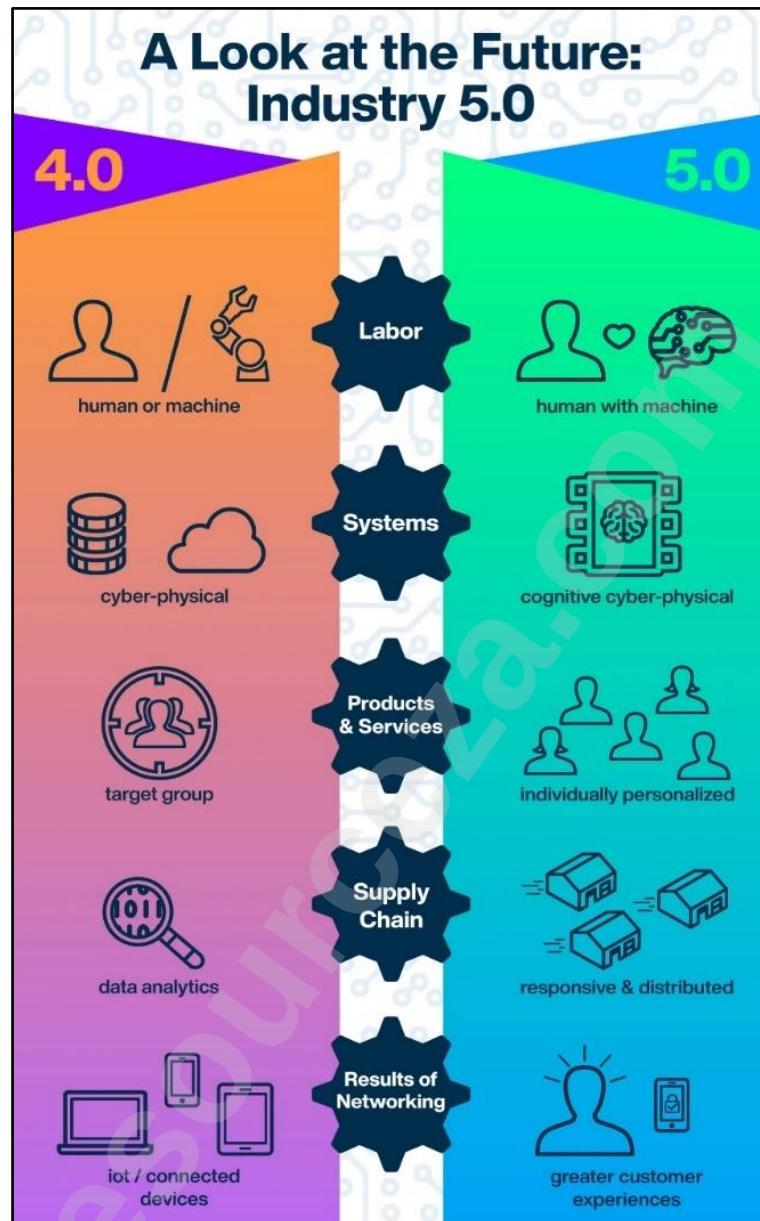
Allow for learner response. Try and encourage discussions around agency and that learners need to be active in their future development. They do not have to rely on structures and organisations which are established, but they can work towards being the ones who establish new structures and organisations. They truly are the future.

- What are your thoughts about Industry 5.0 allowing us to be more human?

Allow for learner response. Some might disagree and say that technologies are taking us further away from what it means to be human. Some might be excited about the idea of 'working less' and engaging more with communities and people. Some learners might be cynical that these technologies are as close to being implemented as people are foretelling. They may also be cynical about the effect of the technologies.

- Imagine yourself living in the Industry 5.0 world as described in this video clip. What and where are you going to make your 'human' impact felt?

The lifestyle proposed by the video clip is one where a person does not have to work as many hours to live. This question is therefore aimed at allowing learners to think about how they would like to positively impact their community if they had the time. Some ideas include animal shelters, communal veggie gardens, mentoring young people, and youth theatre. Any area where the community is bettered can be considered.



[Source: Hibbert, L. (202AD) AI and Machine Learning Infographic – Mouser, Mouser Electronics. Available at: <https://www.mouser.com/ai-and-machine-learning-infographic/> (Accessed: 28 December 2023).]

QUESTION 3**Compulsory – 20 Marks: THE ETHICS SURROUNDING TECHNOLOGY USE**

AIM: Through the exploration of contextual sources, you will explore the need for a collaborative solution to the ethics surrounding the use of AI and nanotechnology.

Name: _____

Class: _____

INSTRUCTIONS

- Read the sources below and then answer the questions that follow.
- Take note of mark allocations as an indication of length and depth of response.

SOURCE 1: Ethical AI: The Potential Consequences of Unethical AI in 2023

Artificial intelligence (AI) has the ability to transform the world. However, it can also be used unethically. There are a number of possible negative consequences of unethical AI use. They include biases and discrimination, violations of privacy and human rights, and unintended harm.

Bias and discrimination

AI systems are trained on data. If the data used contains inherent biases, these biases will show up in the AI system's decisions. For example, some recruitment companies use AI systems when looking at job applications. People could be discriminated against based on their gender, race, or ethnicity. This can continue current societal inequalities and harm marginalised groups.

Violation of privacy and human rights

AI can be used to gather and process large amounts of personal data. This is often without people's consent or knowledge. This can lead to privacy violations and the misuse of sensitive information. For example, governments and law enforcement can use facial recognition technology to identify and track people without their consent. This can breach people's right to privacy and freedom of movement.

Unintended harm

Unintended harm can occur when AI systems are not designed or tested properly. For example, an AI system used in a medical setting that makes incorrect diagnoses or treatment recommendations can harm patients and put their lives at risk.

Examples of non-ethical AI use

Amazon's gender-biased algorithm* used in hiring is a real-world example of unethical AI use. It was found to prefer male applicants over female ones. Another example is facial recognition technology that has been shown to be less accurate for people with darker skin tones. These examples show the possible harm that can be caused by unethical AI use. They also highlight the need for greater attention to ethical thought in AI development.

Ethical AI to prevent negative outcomes

Ethical considerations must be a priority in the entire AI lifecycle to prevent these negative outcomes. This includes ensuring that the data used to train AI systems is diverse and representative. AI systems need to be tested for bias and discrimination. Individuals' privacy and human rights must be respected.

AI technology is still developing and has limitations. It is important to involve human judgment in decision-making processes. This will ensure that ethical concerns are taken into account to prevent AI from making decisions that may be biased or harmful. This is important when the decisions could have huge impacts on individuals or society as a whole, such as medical diagnoses or criminal justice decisions. We can help ensure that AI is used in a responsible and ethical way by including humans in the process.

[Adapted from: Bargagni, S. (2023) *Ethical ai: Consequences of unethical AI in 2023: Blog morphcast, MorphCast*. Available at: <https://www.morphcast.com/ethical-ai-the-potential-consequences-of-unethical-ai-in-2023/#:~:text=Examples%20of%20non%20ethical%20AI,people%20with%20darker%20skin%20tones>. (Accessed: 21 December 2023).]

Glossary

Algorithm: A set of instructions to be followed in calculations or other operations. An AI algorithm is the programming that tells the computer how to learn to operate on its own.

3.1 Provide any ONE of the ethical concerns about AI.

(1)

3.2 In light of the passage, which of the concerns do you consider to be the main ethical concern? Explain your answer.

(2)

3.3 How do you think job applicants could be discriminated against according to their gender, race or ethnicity?

(2)

3.4 What does facial recognition technology allow governments to do, and why is this a concern?

(2)

3.5 How can we ensure that the data used to train AI systems is diverse and inclusive of everyone?

(2)

SOURCE 2: Nanotechnology Challenges, Risks and Ethics

The biggest problem in nanotechnology* is that we need to learn more about materials and their properties at the nanoscale*. Universities and businesses across the world are studying how atoms fit together to form larger structures.

Particles at the microscopic level behave differently than they do in their bigger form. There is a worry that some nanoparticles* could be toxic. We need to be sure that nanoparticles do not poison us if we plan on using them in our everyday lives.

There are social concerns about nanotechnology too. Nanotechnology may also allow us to create more powerful weapons, both deadly and non-deadly. Scientists and politicians need to carefully look at all the implications of nanotechnology before designing powerful weapons.

Is it ethical to use nanotechnology in medicine to enhance* ourselves physically? Medical nanotechnology could make us smarter, stronger and give us other abilities such as rapid healing and night vision. Should we work towards such goals? Could we continue to call ourselves human? Almost every technology starts off as very expensive. Would this mean we would create two races of people – a wealthy race of modified humans and a poorer population of 'normal' people?

Some questions deal with the world of finance and economics. How will building things from the molecular* level impact the world's economy? What happens to all the manufacturing jobs if we can build anything we need with the click of a button and a 3D printer? What happens to currency if we can make anything using a replicator? Would we move to a completely electronic economy? Would we even need money?

The future of nanotechnology is exciting. However, we need to consider the implications for us as humans before adopting this technology in our everyday lives.

[Adapted from: Bonsor, K. and Strickland, J. (2023) *How nanotechnology works*, *HowStuffWorks Science*. Available at: <https://science.howstuffworks.com/nanotechnology5.htm> (Accessed: 21 December 2023).]

Glossary

Nanotechnology: the branch of science and engineering devoted to designing, producing, and using structures, devices, and systems by manipulating atoms and molecules at nanoscale.

Nanoscale: one nanometer is one-billionth of a meter. To give you an idea how small that is: A sheet of paper is about 100,000 nanometers thick.

Nanoparticles: Small particles that range between 1 to 100 nanometres in size. They are undetectable by the human eye.

Enhance: To increase or improve in value, quality, desirability, or attractiveness.

Molecular: Comes from the noun molecule, which means 'extremely minute particle'. Also known as the 'Building blocks of life'.

3.6 Explain the concern mentioned regarding nanoparticles.

(2)

3.7 Analyse the ethical considerations raised regarding using nanotechnology to enhance human abilities.

(2 × 2 = 4)

3.8 Predict and explain ONE possible consequence for society if there were to be 'two races' of people; one modified and one 'normal'.

(2)

3.9 How can the ability to build anything we need end inequality?

(1)

3.10 Taking into consideration both Source 1 and Source 2, how can we ensure that emerging technologies are used ethically to the benefit of all people? Briefly discuss two ways.

(2)
[20]

MARKING GUIDELINES – CAT A, QUESTION 3**MARK DISTRIBUTION FOR CAT A, QUESTION 3**

Questions	Level 1 Remember	Level 2 Understand	Level 3 Apply	Level 4 Analyse	Level 5 Evaluate	Level 6 Create
3.1	1					
3.2					2	
3.3		2				
3.4	2					
3.5			2			
3.6			2			
3.7				4		
3.8					2	
3.9		1				
3.10			2			
TOTAL		12			8	

3.1 Provide any ONE of the ethical concerns about AI.

The use of AI could lead to bias and discrimination. ✓

OR

Privacy and human rights can be violated ✓

(1)

3.2 In light of the source, which of the concerns do you consider to be the main ethical concern? Explain your answer.

The learner is free to respond in any way.

The learner must give their opinion (✓) and substantiate it with a valid explanation (✓).

(2)

3.3 How do you think job applicants could be discriminated against according to their gender, race, or ethnicity?

AI systems are trained using data. (✓) If the data used has inherent biases, then this bias will carry through into the recruitment process. (✓)

(2)

3.4 What does facial recognition technology allow governments to do, and why is this a concern?

Identify and track people. (✓)

This is a concern because it violates a person's right to privacy / freedom of movement. (✓) Either right violation can be accepted for one mark.

(2)

- 3.5 How can we ensure that the data used to train AI systems is diverse and inclusive of everyone?

Allow for any two valid, but variable responses, as long as they are valid and in line with the source.

A few examples:

- **Ensure that women and people of colour are included in AI development teams ✓**
- **Ensure that the data used to train AI systems do not have an inherent bias ✓**
- **Regularly test the AI system for biases ✓** (2)

- 3.6 Explain the concern mentioned regarding nanoparticles.

There is a concern that nanoparticles could be toxic (✓) which could poison us if used in our everyday lives (✓). (2)

- 3.7 Analyse the ethical considerations raised in using nanotechnology to enhance human abilities.

- **The extent to which people will enhance themselves. (✓) At what stage can we still call ourselves human? (✓)**
- **Most technologies are expensive when they are launched. (✓) This will mean that not everyone will have access to these technologies. (✓)** (2 × 2 = 4)

- 3.8 Predict and explain ONE possible consequence for society if there were to be 'two races' of people; one modified and one 'normal'.

The response should include a context and a consequence.

- **There would be discrimination against those who are not modified (✓) which would lead to social unrest (✓)**

OR

People who are more modified could end up with higher-paying work (✓) which would lead to greater economic inequality (✓). (2)

- 3.9 How can the ability to build anything we need end inequality?

People who do not have money can make anything they want without having to pay for it. ✓ (1)

- 3.10 Taking into consideration both Source 1 and Source 2, how can we ensure that emerging technologies are used ethically to the benefit of all people? Briefly discuss two ways.

Allow for learner response.

Any TWO responses from the list below or any other viable answers are permissible

People need to be put at the centre of the technological advancements ✓

Laws which regulate the use of these technologies need to be instituted ✓

Ensure that data used to train AI systems are diverse and representative of all people ✓

Need to conduct regular audits of technological processes ✓

Development teams need to be diverse ✓

Ensure that the design of technologies upholds ethical standards ✓

(2)
[20]

QUESTION 4**Compulsory – 60 Marks: REVOLUTIONISING OUR WORLD****TIME FOR A REVOLUTION?**

AIM: Through research, you will be required to identify an area of society / business that you feel needs to be revolutionised. The skills of analysis, evaluation, and critical thinking will be required to respond adequately to this section.

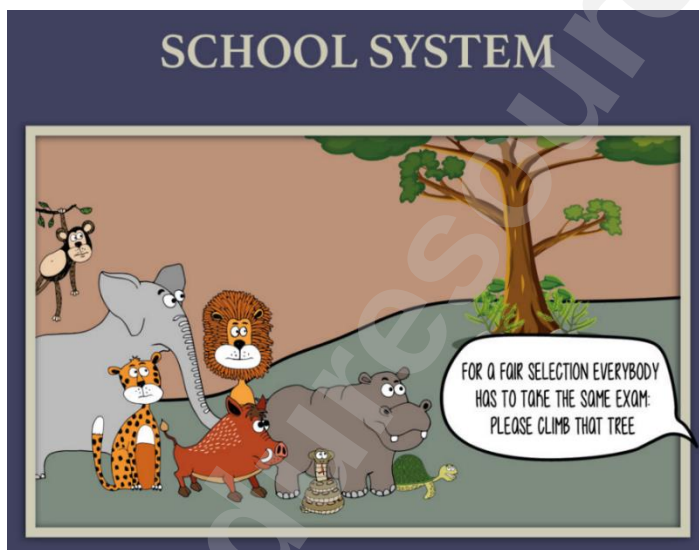
While going through the sources in this booklet, it was established that previous Industrial Revolutions changed how we lived, worked, and interacted with our world. Some, if not most, of these changes are still part of our world and inform how we do things.

But our world is changing, and rapidly. We do not know what our world will look like once things have settled, but we do know that it will be completely different from what we currently know.

'We are currently preparing students for jobs that don't yet exist ... using technologies that haven't been invented ... in order to solve problems we don't even know are problems yet.'

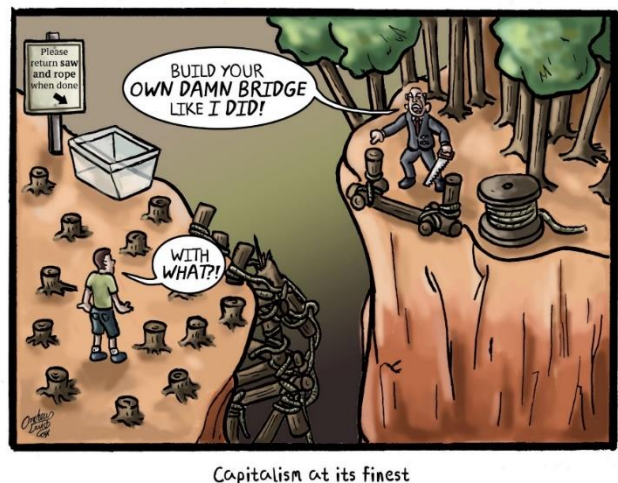
-Gunderson *et al*

[Gunderson, S., Jones, R. & Scanland, K. 2004. The Jobs Revolution: Changing How America Works. Copywriters Inc.]



Eclectic homeschooling (2023) Footprints on Our Land. Available at: <https://www.south-african-homeschool-curriculum.com/eclectic-homeschooling> (Accessed: 27 December 2023).

Ankursengupta (2017) IOT & the Third industrial revolution, Steemit. Available at: <https://steemit.com/technology/@ankursengupta/iot-and-the-third-industrial-revolution> (Accessed: 27 December 2023).



Task instructions – Learner response

You are required to research and select a system in any area of society that you believe needs to be reformed for it to be more relevant in our future world, and to bring greater relevance and positive transformation to a problematic area in society.

Examples of areas you can choose a system from are as follows:

- Finance or Economics
- Education
- Large Business Enterprises
- Ideologies such as meritocracy
- Legislation
- Environmental sustainability
- Politics
- Social Construction

How we live our lives has been affected by previous Industrial Revolutions. Various systems and ways of living were developed for a certain reason, for a certain time, and for certain people. And sometimes those systems need to be revolutionised for the better. Research, and answer the questions below:

4.1 Briefly discuss the area and system you have chosen to analyse.

- What is the area and system you have selected?
- Why have you selected this area and system?

4.2 Research the epigenesis of the system you have selected:

- Why was it developed or put into place?
- How was it developed or put into place?
- By whom was it developed or put into place?
- For whom was it developed or put into place?
- What are its shortcomings now and what will they be potentially in the future?

4.3 Now revolutionise it: Change this area/system so that it will fit in our changing world.

- Describe this revolutionised system.
 - What needs to be implemented to change the area/system you have researched to address the shortcomings you mentioned in 4.2?
(Discuss these requirements in social, financial, scientific, political, educational spaces etc.).
 - What does this adjusted system look like and explain how and why it is better.
- Has this system already been revolutionised elsewhere? If so, where? Explain the changes. If not, what do you think needs to change to bring about the revolution?
- How can these changes add value and solve the problems you identified in 4.2?

You are required to present your information in one of two ways:

Create a presentation where you will present your findings to the class. This can either be presented to the class in a live setting, or recorded and uploaded onto a digital platform. Ensure that you use creative elements, such as images and video clips, to support your presentation using PowerPoint or another digital platform. You need to have a minimum of 15 images/video clips in your presentation.

OR

Create a visual diary where you present your findings on paper. A visual diary is a document that integrates text and images to present information creatively and interestingly. You need to have a minimum of 15 images in your presentation. Your chosen images need to be well-integrated and add value to your information. Avoid clip art-type images as these do not add value.

A reference list must be included. Please ensure you use a recognised academic referencing format.

You are allowed to use an AI tool such as ChatGPT to help start you off on your research. You must indicate which prompts you used, as per the attached document.

You need to use **at least** FIVE other, valid sources in your research (i.e. six sources altogether).

Refer to the Learner Declaration and Marking Rubric on the last page.

Learner Declaration: AI use in Assessment Task**LIFE ORIENTATION CAT A: QUESTION 4**

Learner Name	
Teacher	
Assessment Due Date	

I, _____ (full name) hereby confirm that:

- I have read and understood my school's policy relating to Academic Dishonesty.
- The task submitted has been completed in full by me.
- I have clearly indicated in the task any sections of work that were generated or assisted by AI, giving credit where it is due.
- I have adhered to the school policy regarding Academic Dishonesty – specifically, identifying where AI has been used and citing all sources of information.
- I acknowledge that I may have to verbally explain my answers / solutions presented in this task if asked by my teacher.

Signed: _____

Date: _____

Acknowledgement of AI tools used:

AI Tool used	Purpose	Prompts used

Name: _____

Class: _____

DESCRIPTORS	LEVEL 1	LEVEL 2	LEVEL 3	LEVEL 4
4.1 DESCRIPTION OF THE AREA/ SYSTEM	0–1 marks	2 marks	3 marks	4–5 marks
- What is the area/system you have selected? (2) - Why have you selected this area/system? (3)	Not all elements have been discussed. There are large gaps in the required detail or elements.	All elements have been superficially discussed. The motivation for the selection of the system/area is thin.	All elements have been discussed. Superficial motivation for the selection of the system/area is given.	All elements have been discussed in thorough detail. Clear motivation for the selection of the area/system has been provided.
4.2 EPIGENESIS OF THE AREA/ SYSTEM	0–5 marks	6–8 marks	9–11 marks	12–15 marks
- Why was it developed or put into place? (3) - How was it developed or put into place? (3) - By whom was it developed or put into place? (2) - For whom was it developed or put into place? (2) - What are its shortcomings now and what will they be potentially in the future? (5)	Not all elements have been discussed. Superficial research and the system/area has not been analysed well / has not been provided. Limited shortcomings identified.	All elements have been superficially discussed. Some research is evident and the system/area is superficially analysed. Gaps and shortcomings can be identified.	All elements have been discussed well. The research is detailed, and the system/area has been sufficiently analysed. Only a few shortcomings have been identified.	All elements have been discussed in thorough detail. The research is thorough and the system/area has been critically analysed. Insight is shown in the identification of shortcomings.
4.3 REVOLUTION	0–5 marks	6–9 marks	10–15 marks	16–20 marks
Describe this revolutionised system - What needs to be implemented? (5) - What does this adjusted system look like? Why is it better? (5) Has this system already been revolutionised elsewhere? If so, where? Explain the changes. If not, what do you think needs to change to bring about the revolution? (5) How can these changes add value and solve the problems you identified in 4.2? (5)	Not all of the elements have been discussed. Gaps in logic are shown in the revolutionised system/area. Problem areas are not 'solved'.	All elements have been superficially discussed. Gaps in logic are shown in the revolutionised system/area. Problem areas not 'solved' / very superficially 'solved'.	All elements have been discussed. Insight is shown in the revolutionised system/area. Problem areas 'solved'.	All elements have been discussed in detail. Creative insight is displayed in the revolutionised system/area. Problem areas have been 'solved' realistically and in detail.
PRESENTATION	0–5 marks	6–8 marks	9–11 marks	12–15 marks
	Not much effort has gone into the presentation of the information. Creative elements are chosen haphazardly. Fewer than 15 images are present.	Information has been presented somewhat creatively. The creative elements selected have some relevance. Fewer than 15 images are present / images are not fully complementary.	Information has been presented creatively. Creative elements complement the information. At least 15 images are present.	Information has been presented creatively and insight is shown in the creative elements selected. 15 or more images are present and complement the information well.
REFERENCES & AI DECLARATION	0–1 marks	2 marks	3 marks	4–5 marks
A reference list has been included in the correct academic format. The AI declaration has been included.	Only the URLs are provided, or no reference list has been included. The AI Declaration has not been submitted.	A reference list has been included. Many errors or lack of formatting and the AI declaration has not been submitted.	A reference list has been included, but there are minor errors in formatting. The AI declaration has been submitted.	A reference list has been included in the correct format, as well as the AI declaration.

Comments:

TOTAL: _____/60