CHRT04

NAME:………...

HACKERS PRACTICE

1 When studying historical buildings, one can see a clear progression in construction materials. Before the medieval period, timber was the most widely used building material in Europe, but it came to be replaced by stone in most major structures. Even the use of metals was limited in structural architecture before the industrial age. At that time, metal was mainly used for bridges and greenhouses due to its limited aesthetic appeal. However, the public perception of manmade materials changed and technological progress brought down metalwork's cost, leading to it being used more. The first metal commonly used in architecture was cast iron, which could be formed into decorative shapes like stone. Architects even began using cast iron to construct building frames. Unfortunately, this particular metal has a low tensile strength and several of these buildings collapsed. To address this problem, builders turned to wrought iron and eventually to steel. As public opinion about manmade materials continued to change in the 19th century, the use of concrete became acceptable. The combination of steel and concrete was incredibly strong and allowed for the construction of taller buildings - thoroughly changing urban landscapes. Construction of the tallest building in the world, Dubai's Burj Khalifa, used 4,000 tonnes of steel in combination with 330,000 cubic metres of concrete and 55,000 tonnes of reinforcing steel rebar.

Complete the notes below.

Choose ***ONE WORD AND/OR A NUMBER*** *from the passage for each answer.*

History of Architectural Materials

- Most pre-medieval buildings in Europe used **1** .... for construction.
- Stone construction became popular in the medieval period.
- Manmade materials were not widely used before the industrial age.
- Building the world's highest skyscraper utilised 330,000 cubic metres of concrete and **2** .... of steel.

progression n. sự tiến bộ, sự phát triển **timber** n. gỗ xây dựng, gỗ làm mộc **aesthetic** adj. (thuộc) mỹ học, thẩm mỹ **perception** n. sự nhận thức, tri giác **metalwork** n. tác phẩm nghệ thuật bằng kim loại **cast iron** phr. gang **decorative** adj. để trang hoàng, trang trí **frame** n. khung, cấu trúc **tensile strength** phr. độ bền kéo **wrought iron** phr. sắt rèn **steel** n. thép **rebar** n. thanh cốt thép **landscape** n. cảnh trí, phong cảnh

2 If you have ever been snorkelling or diving along a tropical coral reef, then you have probably heard regular crunching sounds while underwater. These are made when the colourful parrotfish remove algae from the reef's surface by biting and scraping it with their parrot-like beaks. The lifecycle of these fascinating fish begins when they travel into the open sea to discharge their eggs, where they hatch. Following this their early life is spent as larvae in the ocean's plankton population. They then move to the mangroves as juveniles and then to a reef where they will both hide from predators and clean the reef. Interestingly, throughout these stages of development, all parrotfish are drably coloured females. This is because parrotfish are sequential hermaphrodites, meaning they change gender as they age. When they enter the terminal phase of their lives, the young female parrotfish morph into more colourful males. These males then collect a harem of younger female parrotfish and spawn to produce yet another all-female group of larval parrotfish. A further interesting aspect of the parrotfish is its importance in the reef's survival. According to researchers at the International Union for Conservation of Nature, without the cleaning activities of the parrotfish, the reefs would soon be overrun with algae and die.

Complete the flow-chart below.

*Choose **ONE WORD ONLY** from the passage for each answer.*

Parrotfish Lifecycle

Spawning Adult parrotfish move into the open ocean to release their eggs.

⬇

Initial Stage Parrotfish enter the ocean's plankton fields as **3** ....

⬇

Juvenile Stage Juvenile parrotfish spend time in the **4** .... before moving to the reefs.

⬇

Terminal Stage Adult male parrotfish live on the reef with a group of females.

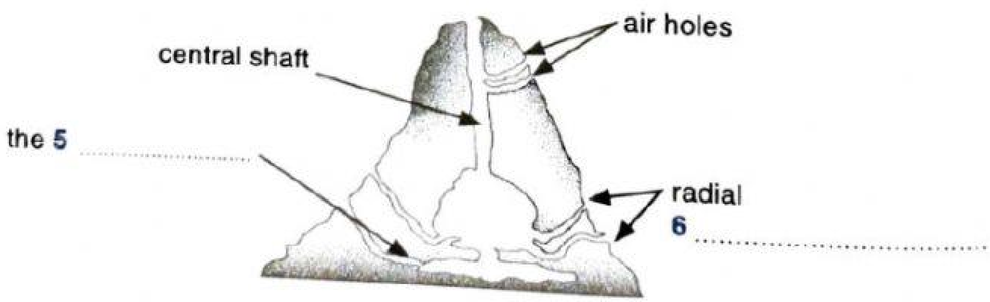
parrotfish n. cá vẹt **algae** n. tảo **larvae** n. ấu trùng **mangrove** n. (thực vật học) cây đước **juvenile** n. thanh thiếu niên **drably** adv. tẻ nhạt, nhợt nhạt **sequential hermaphrodite** phr. lưỡng tính tuần tự (một cá thể thay đổi từ đực sang cái rồi từ cái sang đực) **morph** v. biến đổi **harem** n. bầy/nhóm động vật cái **spawn** v. đẻ trứng (số lượng lớn) **larval** adj. (thuộc) ấu trùng **International Union for Conservation of Nature** phr. Liên Minh Bảo Tồn Thiên Nhiên Thế Giới **overrun** v. lan tràn, tràn ngập

3 Zimbabwe's Eastgate Centre should be the model for modern midrise commercial architecture. It was constructed without mechanical air conditioning, resulting in savings of approximately 3 million pounds for thte complex's owners. Surprisingly, the building is never uncomfortably hot or cold. This is because the architect utilised the process of biomimicry when designing it. Biomimicry involves humans studying a natural process and imitating it to solve a complex human problem. In this case, the designer, Mick Pearce, was inspired by termite mounds. These wood-eating pests build large mounds that can reach 25 metres in height. However, most termites do not inhabit the upper part of the mounds, but they live in a gallery at the base of it. The tall structure above is essentially a large chimney. It contains a central shaft that moves warmer air upward. This warm air then exits through holes near the mound's top. Radial vents at the base intensify this action by capturing the wind and cooling the air at the base of the mound, creating a convection cycle in the structure. After understanding this process, Pearce designed the Eastgate Centre's buildings as a series of rooms around a central shaft. Each room has ducts into the shaft and to the exterior resulting in heat dissipation as in the termite mound. Fans that pull air into the central shaft, producing continuous airflow, assist this system. Through this system, the offices in the Eastgate Centre have a stable internal temperature of approximately 23°C regardless of the external temperature.

Label the diagram below.

*Choose **ONE WORD** from the passage for each answer.*

Termite Mound Layout



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midrise adj. (kiến trúc) trung tầng (không cao không thấp) **biomimicry** n. phỏng sinh (phỏng sinh/mô phỏng sinh học: các thiết kế công nghệ/công nghiệp mô phỏng theo một chu trình tự nhiên) **imitate** v. mô phỏng **termite** n. con mối **mound** n. mô/gò đất **pest** n. loài gây hại **gallery** n. hầm/phòng dài, hành lang **shaft** n. trục **radial** adj. hướng tâm **convection** n. sự đối lưu **duct** n. ống dẫn **dissipation** n. sự xua tan/ tán (nhiệt)

4 Prairie ecosystems are characterised by even terrain or gently sloping rolling hills, and by a predominance of herbaceous plant life. Trees, shrubs, and other woody plants are virtually absent in prairies, and there is very little shelter from the solar radiation and harsh breezes. Prairies generally receive a moderate amount of yearly precipitation, but summers are occasionally marked by severe drought. Consequently, for plants to thrive in the prairie ecosystem, they must endure seasonally dry conditions. Among the herbaceous plants suited for life in these ecosystems are prairie grasses, which have several adaptive mechanisms for survival.

Leaves of prairie grasses vary in width, but most are long, thin blades. On the epidermal layer of the leaves are small holes, called stomata, which can be opened to let in carbon dioxide and release oxygen, or closed to retain moisture. Because carbon dioxide is essential for plant photosynthesis, the stomata must remain wide for gas exchange; however, air spaces within the leaf are full of water vapour, which evaporates unless the pores remain closed and presents a challenge during dry conditions. To overcome the problem, prairie grasses have evolved to distinguish between day and night. In the daytime, the grasses keep their stomata shut to minimise moisture loss. The plants then expand the pores in the evening when the air is cooler for respiration.

Complete the notes below.

*Choose **NO MORE THAN TWO WORDS** from the passage for each answer.*

How Prairie Grasses Survive

Harsh prairie conditions

· Flat land with a few small hills

· A limited amount of protection from **7** .... and high winds

· Some rainfall every year, but summer months bring drought

Prairie grasses' evolutionary adaptation

· Stomata: Tiny holes on the **8** .... of the leaves

· Open to allow carbon dioxide in and oxygen out, or closed to preserve moisture

· The stomata remain closed during the **9** .... to decrease loss of water

· The plant pores are opened in the cooler nighttime air

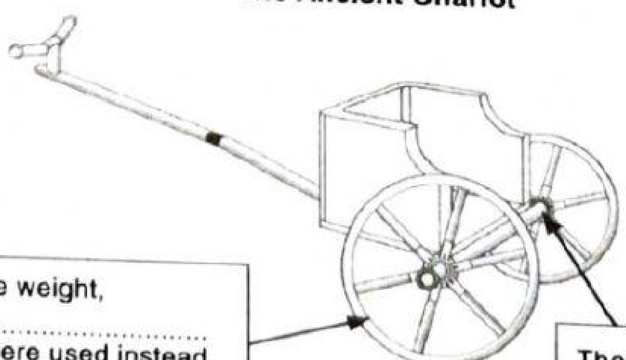
prairie n. đồng cỏ, thảo nguyên **even** adj. bằng phẳng **terrain** n. địa hình **sloping** adj. nghiêng, dốc **rolling** adj. nhấp nhô **predominance** n. tính trội, ưu thế **solar radiation** phr. bức xạ mặt trời **moderate** adj. vừa phải, điều độ **adaptive mechanism** phr. cơ chế thích ứng **herbaceous** adj. (thuộc) thảo mộc **blade** n. phiến (lá) **epidermal** adj. (thuộc) biểu bì **stomata** n. lỗ khí **pore** n. lỗ **respiration** n. sự hô hấp/trao đổi khí

5 Around 2000 B.C., a new invention emerged that changed warfare during the period, the horse-drawn chariot. These light carriages provided cavalry archers with a flat platform from which to attack their enemies. Prior to this time armies that wished to proceed rapidly rode on horseback, but this was cumbersome because saddles and stirrups had not been invented. This made it difficult to steer, hold on to the horse and fire at the same time. Chariots made this much easier. At their most basic, chariots were wheeled platforms drawn behind one or more horses. Perhaps the most famous of these fighting vehicles were used by the ancient Egyptians. Although they did not invent the chariot, the Egyptians adapted them to improve their usefulness. One of the biggest changes was lightening the overall weight of the chariot by utilising newly invented spoked wheels rather than the traditional disk wheel. This made it easier for the horses to pull the chariots faster. However, speed was not the only benefit of the changes implemented by the Egyptians. They also made them much easier to control through the use of the yoke saddle and basic design changes. The yoke saddle was a saddle-like pad that sat on the horses' backs with leather pieces across the horse's chests and bellies to prevent slippage and increase control. The riders' platform, which was connected to the yoke saddle by a long wooden rod, was also redesigned. By moving the rider closer to the chariot's axle, it became more stable for the riders, making it easier to aim and fire at their enemies. Finally, the Egyptians covered the axle with metal to prevent friction against the chariot's platform. This not only improved the vehicle's movement, but it also reduced damage to the vehicle, making them more reliable. Unfortunately, none of these improvements corrected other problems inherent with the chariot's design, and by 1500 B.C. cavalry troops on horseback had replaced them in most military settings. However, they did remain in use as racing vehicles for hundreds of years to come.

Label the diagram below.

*Choose **ONE WORD ONLY** from the passage for each answer.*

The Ancient Chariot



To reduce weight, **10** .... wheels were used instead of traditional disk wheels.

The **11** .... was covered with metal to stop it from rubbing against the platform.

warfare n. chiến sự, chiến tranh **chariot** n. xe ngựa kéo (dùng để đánh trận) **carriage** n. cỗ xe ngựa **cavalry archer** phr. kỵ xạ (kỵ binh ngồi trên xe ngựa và được trang bị cung) **platform** n. kệ, bục **cumbersome** adj. cồng kềnh, bất tiện **saddle** n. yên ngựa **stirrup** n. bàn đạp (ở hai bên yên ngựa để đặt chân) **steer** v. lái, điều khiển **adapt** v. sửa lại cho hợp, thích ứng **spoke** v. thọc gậy vào (bánh xe) **yoke** n. thanh ngang, chạc, ách **pad** n. miếng đệm lót (yên ngựa) **slippage** n. sự trơn trượt **rod** n. gậy, que **axle** n. trục xe **friction** n. sự ma sát **inherent** adj. vốn có, cố hữu **troop** n. quân đội, binh lính

6 Every year, millions of birds participate in annual migrations - moving from one area to another when weather changes make it difficult to find food or when they must seek out potential mates. Some of these journeys are rather simple and merely involve moving to a nearby area, but others can cover more than 10,000 kilometres. To travel such a great distance, birds must possess a strong ability to navigate. Today, it is believed that birds have three methods of navigation: piloting, orientation, and true navigation. Piloting is the easiest of these to understand, because it is how we most often find our way. Put simply, they move from one recognisable visual landmark to the next. Much like we know to turn left after a certain feature when coming home from the supermarket, birds know to follow landmarks, like a river that runs north and south, until they get to the next feature, like a lake. However, this can lead to a problem. When the bird looks at the river, which way should it head? To answer this question, birds may use the second method, orientation, which entails using clues to figure out direction. Over the course of the last 50 years, scientists have observed birds using the sun and stars as compasses to check their direction. Some have even been shown to be able to sense and use Earth's magnetic field to orient themselves. The final method is true navigation, which requires the bird to determine its final destination and find a way to it from their current location. For scientists, this is the most fascinating aspect of avian navigation, because it cannot be explained as simply as the other two. At its most basic, true navigation is the way that birds compensate for problems with the other two systems. For instance, if a bird only knew to fly due south or to only follow one particular geological feature it would be highly susceptible to getting lost. If a storm pushed the bird far west, then flying south would not necessarily get it to the correct destination. Also, what's a bird to do if a landmark has been destroyed since the last migration? While the mechanism used for true navigation remains undiscovered, some researchers, such as Professor Thomas Collett, believe that the birds possess a 'cognitive map'. They believe that birds can use this map, along with the cues they gather from piloting and orienting and their internal clocks, to find their way.

Complete the table below.

*Choose **ONE WORD AND/OR A NUMBER** from the passage for each answer.*

Methods of Avian Navigation

Piloting	Orientation	True Navigation
Birds look for **12** .... which they recognise to navigate by, much like humans do when performing daily errands.	It was discovered within the last **13** .... that birds use cues such as the location of the sun or stars.	Birds set a course between the current location and the ultimate **14** ....

migration n. sự di cư **navigate** v. lái, xác định phương hướng **piloting** n. sự dẫn đường, sự định hướng **orientation** n. sự điều hướng **landmark** n. mốc (định hướng) **feature** n. điểm đặc trưng **entail** v. đòi hỏi, đưa đến **magnetic field** phr. từ trường **orient** v. định vị, định hướng **avian** adj. (thuộc) loài chim **compensate** v. đền bù, bù đắp **due** adv. về hướng, đúng hướng (đông, tây, nam, bắc) **susceptible to** phr. dễ bị ảnh hưởng, dễ mắc

7 Wind Power

Wind power has been used by humans for almost two millennia, usually in the form of windmills which ground grain or pumped water. Horizontal windmills were first introduced in ancient Persia before spreading throughout the Middle East and then being exported to Central Asia, China and India. The vertical windmills which are typical in European agriculture began to be used in the Middle Ages, initially in England, northern France and Flanders. At its peak in 1850, it is thought that there were around 200,000 windmills across Europe, but this number rapidly declined as the Industrial Revolution took hold.

Now wind power is making a dramatic comeback in the form of renewable energy, and the distinctive sight of fields full of towering wind turbines is becoming common throughout the developed world. Wind power is a plentiful source of power, which does not produce gas emissions and uses little land. Although they require significant investment for construction, wind farms are far less costly to run than other energy sources, and their effect on the environment is limited. Denmark currently generates 40 per cent of its electrical power from wind and over 80 other countries around the world are using wind power to generate electricity. There is particularly substantial investment in wind energy in China, which already has the largest wind farm in the world, located in western Gansu province.

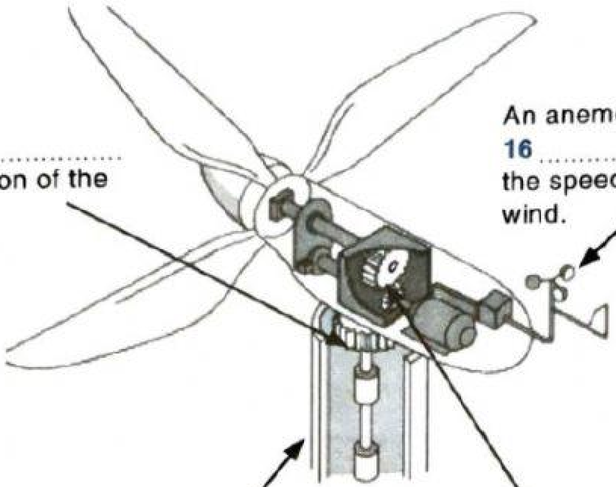
Wind power works by very simply using the kinetic energy generated by wind to power generators which produce electricity. Each wind turbine consists of a tower made from tubular steel, on top of which sits a rotor, formed of blades and a hub, and a nacelle, within which sits the gear box and generator. As the wind flows towards the wind turbine, it propels the blades, a process optimised by a pitch system which adjusts the rotor so that it picks up the optimal amount of wind. This is supplemented by a yaw drive inside the tower, which turns the nacelle to keep the blades facing directly into the wind. An anemometre on the back of the turbine collects wind speed and direction data so that the yaw drive and pitch system can adjust the turbine accordingly. The wind should not be too powerful, as this could damage the blades so the wind turbine's computer system makes sure that high winds are avoided. In case of an emergency the rotors are also connected to a brake, which can shut them down at any time.

The blades are connected to a low-speed shaft, so when the wind pushes the blades around this shaft also begins to spin. This in turn makes the cogs in the gear box spin, which transfers the rotation of the low-speed shaft onto a high-speed shaft, thus increasing the rotational speed to the rate required to generate energy. The spinning of the high-speed shaft then powers a 60-cycle AC generator, converting the energy into electricity which travels down the tower and into a power station where it is converted to the correct voltage to be used in homes, workplaces and factories.

Label the diagram below.

Choose ***NO MORE THAN TWO WORDS*** *from the passage for each answer.*

How a Wind Turbine Works



windmill n. cối xay gió **renewable energy** phr. năng lượng tái tạo **substantial** adj. có giá trị, đáng kể **kinetic** adj. (thuộc) động lực **tubular** adj. có hình ống **rotor** n. rô-to **hub** n. trục **nacelle** n. vỏ động cơ **gear box** phr. hộp bánh răng **propel** v. đẩy **optimise** v. tối ưu hóa **pitch** n. bước răng, bánh răng **optimal** adj. tối ưu **supplement** v. bổ sung **drive** n. thiết bị truyền động **anemometre** n. thiết bị đo gió **accordingly** adv. theo đó **shaft** n. trục **cog** n. răng (bánh xe) **AC generator** phr. máy phát (điện) xoay chiều **voltage** n. điện áp