Population growth worksheet answers biology

By the end of this section, you will be able to: discuss exponential human population growth Explain how humans have expanded the carrying capacity of their habitat to the level of economic growth in different countries discussing the long-term implications of population growth related to population growth and age structure. Earth's human population is growing rapidly, to the extent that some worry about earth's environmental ability to sustain this population. Long-term exponential growth carries potential risks of famine, disease, and mass death. Although humans have increased their environmental carrying capacity, the technologies used to achieve this change have caused unprecedented changes in the Earth's environment, altering ecosystems to the point where some may be at risk of collapse. Depletion of the ozone layer, erosion caused by acid rain and damage caused by global climate change are caused by human activities. The ultimate impact of these changes on our carrying capacity is unknown. As some people point out, it is likely that the negative effects of increasing carrying capacity will outweigh the positive ones - the world's carrying capacity for humans may actually be reduced. The human population is currently experiencing exponential growth, even though human reproduction is far below its bio-capacity (Figure 45.14). To reach their bio-capacity, all women will grow pregnant every nine months during their reproductive years. At the same time, resources must also be such that the environment supports such development. None of these two conditions exist. Despite this fact, the human population is still growing rapidly. Figure 45.14 since human population growth is exponential (dark blue line) since 1000 A.D. Note that the population in Asia (yellow line), which has many economically underdeveloped countries, is growing rapidly, the population in Europe (light blue line), where most countries are economically developed, is growing much slower. One consequence of exponential human population growth is the time reduction that it takes to add a particular number of humans to earth. Figure 45.15 shows that 123 years were necessary to connect 1 billion humans in 1930, but it took only 24 years to connect two billion people between 1975 and 1999. As already discussed, our ability to increase our carrying capacity indefinitely to be limited to mine. Without new technological progress, human growth rates are predicted to slow down in the coming decades. However, the population is still growing and remains at risk of over-population. Figure 45.15 The time between each billion human beings apart for the earth is reduced over time. (Credit: Revision of work by Ryan T. Click through this video of how the human population has changed over time. Humans are unique in their ability to change their environment with the conscious aim of enhancing their ability to increase their environment. This potential is a major factor responsible for a way of overcoming development regulation dependent on human population growth and density. Most of this potential relates to human intelligence, society, and communication. Humans can build shelter to protect them from the elements and have developed agriculture and pets to increase their food supply. In addition, humans use language to communicate this technology for new generations, allowing them to improve past achievements. Other factors in human population growth are migration and public health. Man originated in Africa, but since then almost all on earth have migrated to inhabited land. Public health, hygiene, and the use of antibiotics and vaccines have reduced the potential for infectious disease to limit human population growth. In the past, diseases such as the fourteenth-century bubonic plaque killed between 30 and 60 percent of Europe's population and reduced the total world population by as many as 100,000 people. Today, the risk of infectious disease, while not gone, is certainly less serious. According to the Institute for Health Metrics and Evaluation (IHME) in Seattle, global deaths from infectious disease decreased from 15.4 million in 1990 to 10.4 million in 2017. Compared to some epidemics of the past, the percentage of the world's population killed between 1993 and 2002 decreased from 0.30 percent of the world's population to 0.14 percent. Thus, the infectious disease effect on human population growth is becoming less important. The age structure of the population is an important factor in population mobility. Age structure is the ratio of a population in different age categories. The age structure allows better prediction of population growth, as well as the ability to associate this development with the level of economic growth in the region. In countries with rapid development their age structure diagrams have a pyramid shape, showing the primacy of young individuals, many of whom are of reproductive age or will soon be (Figure 45.16). This pattern is often seen in underdeveloped countries where individuals do not live up to old age due to less optimal living conditions. Age structures of slower-growth areas, including developed countries such as the United States, still have a pyramid structure, but many have a large proportion of younger and older individuals and older persons. In other developed countries, such as Italy, population growth is zero. The age structure of these populations is more coniferous, with an even higher percentage of middle-aged and older individuals. real development Figure 45.17 in various countries is shown, with the highest rate tending to occur in the less economically developed countries of Africa and Asia. Figure 45.16 Specific age structure diagrams are shown. The rapid development diagram narrows to a point, indicating that the number of individuals decreases rapidly with age. In the slow growth model, the number of individuals decreases rapidly with age. Static population diagrams are rounded at the top, indicating that the number of individuals per age group gradually decreases, and then increases to the older part of the population. Age structure diagrams for rapidly growing, slow growing, and stable populations are shown in steps 1 to 3. How do you think population change represents step 4? Figure 4517 The percentage growth rate of population in different countries has been indicated. Note that the highest growth is taking place in less economically developed countries in Africa and Asia. A number of dire predictions have been made about the world's population which has created a major crisis called population explosion. In the 1968 book The Population Bomb, biologist Dr. Paul R. Ehrlich wrote, The battle for all sustenance of humanity is over. Hundreds of millions of people in the 1970s will start starving to death despite any accident program now. Nothing at this late date can prevent a substantial increase in world mortality. Although many experts consider this statement to be wrong on the basis of evidence, the laws of exponential population growth are still in effect, and uncontrolled human population growth cannot continue indefinitely. Many nations have established policies aimed at influencing the population. Efforts to control population growth led to a one-child policy in China, which is now being phased out. India also implements national and regional populations to encourage family planning. Japan, Spain, Russia, Iran and other countries, on the other hand, have made efforts to increase population growth after birth rates dipped. Such policies are controversial, and the human population continues to grow. Food supplies may run out at some point, but the results are difficult to predict. The United Nations estimates that the population growth of the future world may vary from 6 billion (decrease) to 16 billion people by the year 2100. Another consequence of population growth is the threat of the natural environment. Many countries have attempted to reduce the human impact on climate change by reducing greenhouse gas carbon dioxide emissions. However, these treaties have not been ratified by every country. The role of human activity in the cause of climate change has become a hotly debated socio-political issue in some countries, including the United States. Thus, we enter the future with considerable uncertainty about our ability to prevent human population growth and protect our environment. Select launch movie for animation discussing this website and the global effects of human population growth. In this section, you will find out the following questions: What are the features and differences between exponential and logistic development patterns? What are the examples of exponential and logistical growth in natural populations? Population ecologists use mathematical methods to model population dynamics. These models can be used to describe changes in population and better predict future changes. Applying math to these models (and being able to manipulate equations) is in scope for AP®. (Remember that for the AP ® exam you will have access to a formula sheet with these equations.) The information presented and highlighted in the section Support Concepts outlined in Big Idea 4 of AP's Biology Course Framework ® examples. The AP ® Learning Objectives listed in the course framework provide a transparent foundation for AP® biology courses, a probe-based laboratory experience, instructional activities, and ap ® exam questions. A learning purpose merges the necessary materials with one or more of the seven science practices. Although life history describes the many characteristics of the population (such as their age structure) over time in a normal way, population ecologists mathematically use different methods to model population dynamics. These more accurate models can then be used to accurately describe changes occurring in a population and better predict future changes. Some models that are accepted for decades are now being revised or even abandoned due to a lack of predictive potential, and scholars strive to create effective new models. Charles Darwin, in his theory of natural selection, was greatly influenced by the English pastor Thomas Malthus. Malthus published a book in 1798 that said that populations with unlimited natural resources grow very fast, and then population growth decreases with the depletion of resources. This sharp pattern of size of growing population is called exponential growth. The best example of exponential growth is seen in bacteria. Bacteria are prokarots that reproduce by prokaryotic fragmentation. This division takes about an hour for many bacterial species. If 1000 bacteria are placed in a large flask with an unlimited supply of nutrients (so the nutrients will not be eliminated), then after an hour, there is a round of division and each organism is divided, resulting in an increase of 2000 organisms-1000. In another hour, each of the 20 organisms will double, producing 40, an increase of 20 organisms. After the third hour, there should be 8000 bacteria in the flask, with an increase of 4000 organisms. The important concept of exponential development is that the population growth rate - the number of organisms in each is overly fast; That is, it is growing at a greater rate. Out of these, after 1 day and 24 cycles, the population would have increased from 1000 to more than 16 billion. When the size of the population, N, is plotted over time, a J-shaped growth curve (Figure 36.9) is produced. The bacterial example is not representative of the real world where resources are limited. In addition, some bacteria will die during the experiment and thus will not reproduce, reducing the growth rate. Therefore, while calculating the growth rate of the population, the mortality rate (d) (the number of organisms that die during a particular time interval) is reduced from the birth rate (b) (the number of organisms that arise during that interval). It is shown in the following formula: TN (change in number) TT (change in time) = b (birth rate) - d (mortality) TN (change in number) TT (change in time) = b (birth rate) - d (mortality) birth rate is usually expressed on the per capita (for each person) basis. Thus, B (birth rate) = BN (per capita birth rate B number n) and D (mortality rate) = DN (per capita mortality rate multiplied by d number n) of individuals. Additionally, ecologists are interested in the population at a particular point in time, an infinitely short time interval. For this reason, the terminology of difference calculus is used to achieve instantaneous growth rates, replacing changes in number and time with immediate-specific measurements of numbers and times. DN DT = BN − DN = (B-D) N DN DT = BN − DN = (b - d) N Notice that refers to the D derivative associated with the first word (as used in the word calculus) and differs from the mortality rate, also called D. The difference between birth and mortality is further simplified by replacing the term R (internal rate of increase) for the relationship between birth and mortality: DN DN= RN DN DN Value R can be positive, meaning the population is growing in size; or negative, which means the population is decreasing in size; or zero, where the population size is unchanged, is a condition known as zero population growth. Another refinement of the formula assumes that the internal rate of growth in different species (often thought of as fertility), even ideal conditions have inherent differences. Obviously, a bacterium can reproduce more quickly and has a higher internal rate of growth than humans. The maximum growth rate for a species is its bio capacity, or RMAX, thus changing the equation: DN DT = R Max N DN DT = R Max N Figure 36.9 When resources are unlimited, the population exhibits exponential growth, resulting in a J-shaped curve. When resources are limited, the population Logistic growth. In logistic development, population expansion decreases as resources become scarce, and when the environment's carrying capacity is reached, this level closes, resulting in an S-shaped curve. Exponential development is possible only if infinite natural resources are available; This is not the case in the real world. Charles Darwin recognized the fact in his description of the struggle for survival, stating that individuals will compete (with themselves or with members of other species) for limited resources. Successful people will survive to pass on their characteristics and traits (which we know are now transferred by genes) to the next generation at a larger rate (natural selection). To model the reality of limited resources, population ecologists developed logistics development models. In the real world, with its limited resources, exponential development cannot continue indefinitely. Exponential growth can occur in environments where there are some individuals and plentiful resources, but when the number of individuals becomes large enough, resources will be depleted, the growth rate slows. Eventually, the growth rate will plateau or level off (Figure 36.9). This population size, which represents the maximum population size that can support a particular environment, is called carrying capacity, or the formula we use to calculate logistic development adds affordability as an arbitration force to the growth rate. Expression K-N is an indication of how many individuals can be added to the population at a given stage, and K-N divided by K-N is a fraction of the ability to carry available for further development. Thus, the exponential development model is restricted by this factor to generate the logistics development equation: DN DT= R Max DN DT = R Max N (K-N) K dN dT = r max dN dN dN = r max N (K -N) K Notice that when n is too small, (K-N)/K K/K or gets closer to 1, and the right side of the equation reduces rmaxN, meaning that the population is growing rapidly and not affected by carrying capacity. On the other hand, when N is larger, (K-N)/K come close to zero, which means population growth will be much slower or even closed. Thus, the ability to move population growth into large populations is much slower by Kashmir. This model also allows for a population of negative population growth, or a decline in population. This is when the number of individuals in the population exceeds the carrying capacity (because the value of (K-N)/K is negative). A graph of this equation yields an S-shaped curve (Figure 36.9), and is a more realistic model of population growth than exponential growth. There are three different sections for the S-shaped curve. Initially, development is exponential because some individuals and enough resources are available. Then, as resources begin to limit, The rate decreases. Finally, development levels close at the carrying capacity of the environment, with little change in population size over time. The logistic model assumes that every person within a population will have equal access to resources and thus, an equal chance for survival. For plants, water, sunlight, nutrient content and places to grow are important resources, while in animals, important resources include food, water, shelter, nesting space and companion. In the real world, phenotypeic variation between individuals within the population means that some individuals will be better adapted to their environment than others. The resulting competition between population members of the same species for resources is called intraspecific competition (intra-= within; -specific = species). Interspecial competition for resources cannot affect populations that are far below their carrying capacity - resources are plentiful and all individuals can achieve what they need. However, as the size of the population increases, this competition intensifies. Furthermore, the accumulation of waste products can reduce the carrying capacity of the environment. Yeast, a microscopic fungus used to make bread, displays the classical S-shaped curve when grown in a test tube (Figure 36.10a). Its growth levels are far from over as the population decreases the nutrients that are essential for its development. In the real world, however, there are variations in this idealized curve. Examples in wild populations include sheep and port seals (Figure 36.10b). In both instances, the population size exceeds the carrying capacity for a shorter time and then subsequently falls below the carrying capacity. This fluctuation in population size continues as the population oscillates around its carrying capacity. Yet, even with this oscillation, the logistics model is confirmed. The population gradually grows at the bottom of the curve, registering extremely rapid growth in the exponential part of the curve, and then stops growing once it reaches the ability to move. The population may also decline if it exceeds the potential of the environment. The question is an application of AP® Learning Objective 4.12 and Science Practice 2.2 as students apply mathematical routines to population growth model. Figure 36.10 (a) Yeast grown in ideal conditions in a test tube show a classical S-shaped logistics growth curve, while (b) a natural population of seals reflects real-world fluctuations. Explain the underlying reasons for the difference in the two curves shown in these examples. Yeast is grown under ideal conditions, so the curve reflects the limitations of resources in a controlled environment. Seals live in a natural habitat, where the same types of resources are limited; But, they face other pressures such as migration and changing weather. Yeast is grown under natural conditions, so The environment reflects the limitations of resources. Young men were also seen in natural conditions; But, there were more pressures besides the range of resources such as migration and changing weather. Yeast is grown under ideal conditions, so the curve reflects the limitations of resources in an uncontrolled environment. Seals live in a natural environment, where the same types of resources are limited; But they face other pressures, such as migration and changing weather. Yeast is grown under ideal conditions, so the curve reflects the limitations of resources in a controlled environment. Seals live in a natural environment, where the same types of resources are limited; But, they have to face another pressure to flee the jawans outside the population. Population.