

Version: 3.0

Topic 1, Reading Comprehension

Question: 1

Most economists in the United States seem captivated by spell of the free market. Consequently, nothing seems good or normal that does not accord with the requirements of the free market. A price that is determined by the seller or for that matter, established by anyone other than the aggregate of consumers seems pernicious, accordingly, it requires a major act of will to think of price – fixing (the determination of prices by the seller) as both “normal” and having a valuable economic function. In fact, price-fixing is normal in all industrialized societies because the industrial system itself provides, as an effortless consequence of its own development, the pricefixing that requires, Modern industrial planning requires and rewards great size. Hence a comparatively small number of large firms will be competing for the same group of consumers. That each large firm will act with consideration of its own needs and thus avoid selling its products for more than its competitors charge is commonly recognized by advocates of free-markets economic theories. But each large firms will also act with full consideration of the needs that it has in common with the other large firms competing for the same customers. Each large firm will thus avoid significant price cutting, because price cutting would be prejudicial to the common interest in a stable demand for products. Most economists do not see price-fixing when it occurs because they expect it to be brought about by a number of explicit agreements among large firms; it is not. More over those economists who argue that allowing the free market to operate without interference is the most efficient method of establishing prices have not considered the economies of non socialist countries other than the United States. These economies employ intentional pricefixing usually in an overt fashion. Formal price fixing by cartel and informal price fixing by agreements covering the members of an industry are common place. Were there something peculiarly efficient about the free market and inefficient about price fixing, the countries that have avoided the first and used the second would have suffered drastically in their economic development. There is no indication that they have.

Socialist industry also works within a frame work of controlled prices. In early 1970’s, the Soviet Union began to give firms and industries some of the flexibility in adjusting prices that a more informal evolution has accorded the capitalist system. Economists in the United States have hailed the change as a return to the free market. But Soviet firms are no more subject to prices established by free market over which they exercise little influenced than are capitalist firms. The primary purpose of the passage is to

A. refutesthe theory that the free market plays a useful role in the development of industrialized societies.

B. suggestsmethods by which economist and members of the government of the United States can recognize and combat price-fixing by large firms.

- C. explain the various ways in which industrialized societies can fix in order to stabilize the free market
- D. argue that price-fixing, in one form or another, is an inevitable part and benefit to the economy of any industrialized society.
- E. Analysis of free markets in different economies

Answer: E

Question: 2

Most economists in the United States seem captivated by the spell of the free market. Consequently, nothing seems good or normal that does not accord with the requirements of the free market. A price that is determined by the seller or, for that matter, established by anyone other than the aggregate of consumers seems pernicious; accordingly, it requires a major act of will to think of price-fixing (the determination of prices by the seller) as both "normal" and having a valuable economic function. In fact, price-fixing is normal in all industrialized societies because the industrial system itself provides, as an effortless consequence of its own development, the price fixing that requires. Modern industrial planning requires and rewards great size. Hence a comparatively small number of large firms will be competing for the same group of consumers. That each large firm will act with consideration of its own needs and thus avoid selling its products for more than its competitors charge is commonly recognized by advocates of free-market economic theories. But each large firm will also act with full consideration of the needs that it has in common with the other large firms competing for the same customers. Each large firm will thus avoid significant price cutting, because price cutting would be prejudicial to the common interest in a stable demand for products. Most economists do not see price-fixing when it occurs because they expect it to be brought about by a number of explicit agreements among large firms; it is not. More over those economists who argue that allowing the free market to operate without interference is the most efficient method of establishing prices have not considered the economies of non-socialist countries other than the United States. These economies employ intentional price fixing usually in an overt fashion. Formal price fixing by cartel and informal price fixing by agreements covering the members of an industry are common place. Were there something peculiarly efficient about the free market and inefficient about price fixing, the countries that have avoided the first and used the second would have suffered drastically in their economic development. There is no indication that they have.

Socialist industry also works within a framework of controlled prices. In the early 1970's, the Soviet Union began to give firms and industries some of the flexibility in adjusting prices that a more informal evolution has accorded the capitalist system. Economists in the United States have hailed the change as a return to the free market. But Soviet firms are no more subject to prices established by free market over which they exercise little influence than are capitalist firms. The passage provides information that would answer which of the following questions about price fixing?

- I. What are some of the ways in which prices can be fixed?
- II. For what products is price-fixing likely to be more profitable than the operation of the free market?
- III. Is price-fixing more common in socialist industrialized societies or in non-socialist industrialized

societies?

- A. I only
- B. III only
- C. I and II only
- D. II and III only
- E. I, II and III

Answer: A

Question: 3

Most economists in the United States seem captivated by spell of the free market. Consequently, nothing seems good or normal that does not accord with the requirements of the free market. A price that is determined by the seller or for that matter, established by anyone other than the aggregate of consumers seems pernicious, Accordingly, it requires a major act of will to think of price – fixing (the determination of prices by the seller) as both “normal” and having a valuable economic function. In fact, price-fixing is normal in all industrialized societies because the industrial system itself provides, as an effortless consequence of its own development, the pricefixing that requires, Modern industrial planning requires and rewards great size. Hence a comparatively small number of large firms will be competing for the same group of consumers. That each large firm will act with consideration of its own needs and thus avoid selling its products for more than its competitors charge is commonly recognized by advocates of free-markets economic theories. But each large firms will also act with full consideration of the needs that it has in common with the other large firms competing for the same customers. Each large firm will thus avoid significant price cutting, because price cutting would be prejudicial to the common interest in a stable demand for products. Most economists do not see price-fixing when it occurs because they expect it to be brought about by a number of explicit agreements among large firms; it is not. More over those economists who argue that allowing the free market to operate without interference is the most efficient method of establishing prices have not considered the economies of non socialist countries other than the United States. These economies employ intentional price-fixing usually in an overt fashion. Formal price fixing by cartel and informal price fixing by agreements covering the members of an industry are common place. Were there something peculiarly efficient about the free market and inefficient about price fixing, the countries that have avoided the first and used the second would have suffered drastically in their economic development. There is no indication that they have.

Socialist industry also works within a frame work of controlled prices. In early 1970’s, the soviet union began to give firms and industries some of the flexibility in adjusting prices that a more informal evolution has accorded the capitalist system. Economists in the United States have hailed the change as a return to the free market. But Soviet firms are no more subject to prices established by free market over which they exercise little influenced than are capitalist firms. The author's attitude toward "Most economists in the United States" can best be described as

- A. spiteful and envious
- B. scornful and denunciatory

- C. critical and condescending
- D. ambivalent but deferential
- E. uncertain but interested

Answer: C

Question: 4

Most economists in the United States seem captivated by spell of the free market. Consequently, nothing seems good or normal that does not accord with the requirements of the free market. A price that is determined by the seller or for that matter, established by anyone other than the aggregate of consumers seems pernicious, Accordingly, it requires a major act of will to think of price – fixing (the determination of prices by the seller) as both “normal” and having a valuable economic function. In fact, price-fixing is normal in all industrialized societies because the industrial system itself provides, as an effortless consequence of its own development, the pricefixing that requires, Modern industrial planning requires and rewards great size. Hence a comparatively small number of large firms will be competing for the same group of consumers. That each large firm will act with consideration of its own needs and thus avoid selling its products for more than its competitors charge is commonly recognized by advocates of free-markets economic theories. But each large firms will also act with full consideration of the needs that it has in common with the other large firms competing for the same customers. Each large firm will thus avoid significant price cutting, because price cutting would be prejudicial to the common interest in a stable demand for products. Most economists do not see price-fixing when it occurs because they expect it to be brought about by a number of explicit agreements among large firms; it is not. More over those economists who argue that allowing the free market to operate without interference is the most efficient method of establishing prices have not considered the economies of non socialist countries other than the United States. These economies employ intentional pricefixing usually in an overt fashion. Formal price fixing by cartel and informal price fixing by agreements covering the members of an industry are common place. Were there something peculiarly efficient about the free market and inefficient about price fixing, the countries that have avoided the first and used the second would have suffered drastically in their economic development. There is no indication that they have.

Socialist industry also works within a frame work of controlled prices. In early 1970’s, the soviet union began to give firms and industries some of the flexibility in adjusting prices that a more informal evolution has accorded the capitalist system. Economists in the United States have hailed the change as a return to the free market. But Soviet firms are no more subject to prices established by free market over which they exercise little influenced than are capitalist firms. It can be inferred from the author's argument that a price fixed by the seller "seems pernicious" because

- A. people do not have confidence in large firms
- B. people do not expect the government to regulate prices
- C. most economists believe that consumers as a group should determine prices.
- D. most economists associate fixed prices with communist and socialist economies.
- E. Most economists believe that no one group should determine prices.

Answer: C

Question: 5

Most economists in the United States seem captivated by spell of the free market. Consequently, nothing seems good or normal that does not accord with the requirements of the free market. A price that is determined by the seller or for that matter, established by anyone other than the aggregate of consumers seems pernicious, Accordingly, it requires a major act of will to think of price – fixing (the determination of prices by the seller) as both “normal” and having a valuable economic function. In fact, price-fixing is normal in all industrialized societies because the industrial system itself provides, as an effortless consequence of its own development, the pricefixing that requires, Modern industrial planning requires and rewards great size. Hence a comparatively small number of large firms will be competing for the same group of consumers. That each large firm will act with consideration of its own needs and thus avoid selling its products for more than its competitors charge is commonly recognized by advocates of free-markets economic theories. But each large firms will also act with full consideration of the needs that it has in common with the other large firms competing for the same customers. Each large firm will thus avoid significant price cutting, because price cutting would be prejudicial to the common interest in a stable demand for products. Most economists do not see price-fixing when it occurs because they expect it to be brought about by a number of explicit agreements among large firms; it is not. More over those economists who argue that allowing the free market to operate without interference is the most efficient method of establishing prices have not considered the economies of non socialist countries other than the United States. These economies employ intentional pricefixing usually in an overt fashion. Formal price fixing by cartel and informal price fixing by agreements covering the members of an industry are common place. Were there something peculiarly efficient about the free market and inefficient about price fixing, the countries that have avoided the first and used the second would have suffered drastically in their economic development. There is no indication that they have.

Socialist industry also works within a frame work of controlled prices. In early 1970’s, the soviet union began to give firms and industries some of the flexibility in adjusting prices that a more informal evolution has accorded the capitalist system. Economists in the United States have hailed the change as a return to the free market. But Soviet firms are no more subject to prices established by free market over which they exercise little influenced than are capitalist firms. The suggestion in the passage that price-fixing in industrialized societies is normal arises from the author's statement that price-fixing is

- A. a profitable result of economic development
- B. an inevitable result of the industrial system
- C. the result of a number of carefully organized decisions.
- D. a phenomenon common to industrialized and to industrialized societies.
- E. a phenomenon best achieved cooperatively by government and industry.

Answer: B

Question: 6

Most economists in the United States seem captivated by spell of the free market. Consequently, nothing seems good or normal that does not accord with the requirements of the free market. A price that is determined by the seller or for that matter, established by anyone other than the aggregate of consumers seems pernicious. Accordingly, it requires a major act of will to think of price – fixing (the determination of prices by the seller) as both “normal” and having a valuable economic function. In fact, price-fixing is normal in all industrialized societies because the industrial system itself provides, as an effortless consequence of its own development, the price-fixing that requires. Modern industrial planning requires and rewards great size. Hence a comparatively small number of large firms will be competing for the same group of consumers. That each large firm will act with consideration of its own needs and thus avoid selling its products for more than its competitors charge is commonly recognized by advocates of free-markets economic theories. But each large firms will also act with full consideration of the needs that it has in common with the other large firms competing for the same customers. Each large firm will thus avoid significant price cutting, because price cutting would be prejudicial to the common interest in a stable demand for products. Most economists do not see price-fixing when it occurs because they expect it to be brought about by a number of explicit agreements among large firms; it is not. More over those economists who argue that allowing the free market to operate without interference is the most efficient method of establishing prices have not considered the economies of non socialist countries other than the United States. These economies employ intentional pricefixing usually in an overt fashion. Formal price fixing by cartel and informal price fixing by agreements covering the members of an industry are common place. Were there something peculiarly efficient about the free market and inefficient about price fixing, the countries that have avoided the first and used the second would have suffered drastically in their economic development. There is no indication that they have. Socialist industry also works within a frame work of controlled prices. In early 1970’s, the soviet union began to give firms and industries some of the flexibility in adjusting prices that a more informal evolution has accorded the capitalist system. Economists in the United States have hailed the change as a return to the free market. But Soviet firms are no more subject to prices established by free market over which they exercise little influenced than are capitalist firms. According to the author, priced-fixing in nonsocialist countries is often.

- A. accidental but productive
- B. illegal but useful
- C. legit and innovative
- D. traditional and rigid
- E. intentional and widespread

Answer: E

Question: 7

Most economists in the United States seem captivated by spell of the free market. Consequently, nothing seems good or normal that does not accord with the requirements of the free market. A price that is determined by the seller or for that matter, established by anyone other than the aggregate of consumers seems pernicious. Accordingly, it requires a major act of will to think of price – fixing (the determination of prices by the seller) as both “normal” and having a valuable economic function. In fact, price-fixing is normal in all industrialized societies because the industrial system itself provides, as an effortless consequence of its own development, the pricefixing that requires. Modern industrial planning requires and rewards great size. Hence a comparatively small number of large firms will be competing for the same group of consumers. That each large firm will act with consideration of its own needs and thus avoid selling its products for more than its competitors charge is commonly recognized by advocates of free-markets economic theories. But each large firms will also act with full consideration of the needs that it has in common with the other large firms competing for the same customers. Each large firm will thus avoid significant price cutting, because price cutting would be prejudicial to the common interest in a stable demand for products. Most economists do not see price-fixing when it occurs because they expect it to be brought about by a number of explicit agreements among large firms; it is not. More over those economists who argue that allowing the free market to operate without interference is the most efficient method of establishing prices have not considered the economies of non socialist countries other than the United States. These economies employ intentional pricefixing usually in an overt fashion. Formal price fixing by cartel and informal price fixing by agreements covering the members of an industry are common place. Were there something peculiarly efficient about the free market and inefficient about price fixing, the countries that have avoided the first and used the second would have suffered drastically in their economic development. There is no indication that they have.

Socialist industry also works within a frame work of controlled prices. In early 1970’s, the soviet union began to give firms and industries some of the flexibility in adjusting prices that a more informal evolution has accorded the capitalist system. Economists in the United States have hailed the change as a return to the free market. But Soviet firms are no more subject to prices established by free market over which they exercise little influenced than are capitalist firms. According to the author, what is the result of the Soviet Union's change in economic policy in the 1970's?

- A. Soviet firms show greater profit
- B. Soviet firms have less control over the free market
- C. Soviet firms are able to abject to technological advances.
- D. Soviet firms have some authority to fix prices.
- E. Soviet firms are moreresponsive to the free market.

Answer: D

Question: 8

Most economists in the United States seem captivated by spell of the free market. Consequently, nothing seems good or normal that does not accord with the requirements of the free market. A price that is determined by the seller or for that matter, established by anyone other than the aggregate of consumers seems pernicious. Accordingly, it requires a major act of will to think of price – fixing (the determination of prices by the seller) as both “normal” and having a valuable economic function. In fact, price-fixing is normal in all industrialized societies because the industrial system itself provides, as an effortless consequence of its own development, the pricefixing that requires. Modern industrial planning requires and rewards great size. Hence a comparatively small number of large firms will be competing for the same group of consumers. That each large firm will act with consideration of its own needs and thus avoid selling its products for more than its competitors charge is commonly recognized by advocates of free-markets economic theories. But each large firms will also act with full consideration of the needs that it has in common with the other large firms competing for the same customers. Each large firm will thus avoid significant price cutting, because price cutting would be prejudicial to the common interest in a stable demand for products. Most economists do not see price-fixing when it occurs because they expect it to be brought about by a number of explicit agreements among large firms; it is not. More over those economists who argue that allowing the free market to operate without interference is the most efficient method of establishing prices have not considered the economies of non socialist countries other than the United States. These economies employ intentional pricefixing usually in an overt fashion. Formal price fixing by cartel and informal price fixing by agreements covering the members of an industry are common place. Were there something peculiarly efficient about the free market and inefficient about price fixing, the countries that have avoided the first and used the second would have suffered drastically in their economic development. There is no indication that they have. Socialist industry also works within a frame work of controlled prices. In early 1970’s, the soviet union began to give firms and industries some of the flexibility in adjusting prices that a more informal evolution has accorded the capitalist system. Economists in the United States have hailed the change as a return to the free market. But Soviet firms are no more subject to prices established by free market over which they exercise little influenced than are capitalist firms. With which of the following statements regarding the behavior of large firms in industrialized societies would the author be most likely to agree.

- A. The directors of large firms will continue to anticipate the demand for products
- B. The directors of large firms are less interested in achieving a predictable level of profit tan in achieving a large profit.
- C. The directors of large firms will strive to reduce the costs of their products.
- D. Many directors of large firms believe that the government should establish the prices that will be charged for products.
- E. Many directors of large firms believe that the price charged for products is likely to increase annually.

Answer: A

Question: 9

Most economists in the United States seem captivated by spell of the free market. Consequently, nothing seems good or normal that does not accord with the requirements of the free market. A price that is determined by the seller or for that matter, established by anyone other than the aggregate of consumers seems pernicious, Accordingly, it requires a major act of will to think of price – fixing (the determination of prices by the seller) as both “normal” and having a valuable economic function. In fact, price-fixing is normal in all industrialized societies because the industrial system itself provides, as an effortless consequence of its own development, the pricefixing that requires, Modern industrial planning requires and rewards great size. Hence a comparatively small number of large firms will be competing for the same group of consumers. That each large firm will act with consideration of its own needs and thus avoid selling its products for more than its competitors charge is commonly recognized by advocates of free-markets economic theories. But each large firms will also act with full consideration of the needs that it has in common with the other large firms competing for the same customers. Each large firm will thus avoid significant price cutting, because price cutting would be prejudicial to the common interest in a stable demand for products. Most economists do not see price-fixing when it occurs because they expect it to be brought about by a number of explicit agreements among large firms; it is not. More over those economists who argue that allowing the free market to operate without interference is the most efficient method of establishing prices have not considered the economies of non socialist countries other than the United States. These economies employ intentional pricefixing usually in an overt fashion. Formal price fixing by cartel and informal price fixing by agreements covering the members of an industry are common place. Were there something peculiarly efficient about the free market and inefficient about price fixing, the countries that have avoided the first and used the second would have suffered drastically in their economic development. There is no indication that they have. Socialist industry also works within a frame work of controlled prices. In early 1970’s, the soviet union began to give firms and industries some of the flexibility in adjusting prices that a more informal evolution has accorded the capitalist system. Economists in the United States have hailed the change as a return to the free market. But Soviet firms are no more subject to prices established by free market over which they exercise little influenced than are capitalist firms. In the passage, the author is primarily concerned with

- A. predicting the consequences of a practice
- B. criticizing a point of view
- C. calling attention to recent discoveries
- D. proposing a topic for research
- E. summarizing conflicting opinions

Answer: B

Question: 10

The discoveries of the white dwarf, the neutron star, and the black hole, coming well after the discovery of the red giant are among the most exciting developments in decades because they may well present physicists with their greatest challenge since the failure of classical mechanics. In the life cycle of the star, after all of the hydrogen and helium fuel has been burned, the delicate balance between the outer nuclear radiations. Pressure and the stable gravitational force becomes disturbed and slow contraction begins. As compression increases, a very dense plasma forms. If the initial star had mass of less than 1.4 solar masses (1.4 times the mass of our sun), the process ceases at the density of 1,000 tons per cubic inch, and the star becomes the white dwarf. However, if the star was originally more massive, the white dwarf plasma can't resist the gravitational pressures, and in rapid collapse, all nuclei of the star are converted to a gas of free neutrons. Gravitational attraction compresses this neutron gas rapidly until a density of 10 tons per cubic inch is reached; at this point the strong nuclear force resists further contraction. If the mass of the star was between 1.4 and a few solar masses, the process stops here, and we have a neutron star. But if the original star was more massive than a few solar masses, even the strong nuclear forces cannot resist the gravitational crunch. The neutrons are forced into one another to form heavier hadrons and these in turn coalesce to form heavier entities, of which we as yet know nothing. At this point, a complete collapse of the stellar mass occurs; existing theories predict a collapse to infinite density and infinitely small dimensions. Well before this, however, the surface gravitational force would become so strong that no signal could ever leave the star - any photon emitted would fall back under gravitational attraction - and the star would become black hole in space. This gravitational collapse poses a fundamental challenge to physics. When the most widely accepted theories predict such improbable things as infinite density and infinitely small dimensions, it simply means that we are missing some vital insight. This last happened in physics in the 1930's, when we faced the fundamental paradox concerning atomic structure. At that time, it was recognized that electrons moved in stable orbits about nuclei in atoms. However, it was also recognized that if charge is accelerated, as it must be to remain in orbit, it radiates energy; so, theoretically, the electron would be expected eventually to spiral into the nucleus and destroy the atom. Studies centered around this paradox led to the development of quantum mechanics. It may well be that an equivalent advance awaits us in investigating the theoretical problems presented by the phenomenon of gravitational collapse.

The primary purpose of the passage is to

- A. offer new explanations for the collapse of stars.
- B. explain the origins of black holes, neutron stars, and white dwarfs.
- C. compare the structure of atoms with the structure of the solar system.
- D. explain how the collapse of stars challenges accepted theories of physics.
- E. describe the imbalance between radiation pressure and gravitational force.

Answer: D

Question: 11

The discoveries of the white dwarf, the neutron star, and the black hole, coming well after the discovery of the red giant are among the most exciting developments in decades because they may well present physicists with their greatest challenge since the failure of classical mechanics. In the life cycle of the star, after all of the hydrogen and helium fuel has been burned,

the delicate balance between the outer nuclear radiations. Pressure and the stable gravitational force becomes disturbed and slow contraction begins. As compression increases, a very dense plasma forms. If the initial star had mass of less than 1.4 solar masses (1.4 times the mass of our sun), the process ceases at the density of 1,000 tons per cubic inch, and the star becomes the white dwarf. However, if the star was originally more massive, the white dwarf plasma can't resist the gravitations pressures, and in rapid collapse, all nuclei of the star are converted to a gas of free neutrons. Gravitational attraction compresses this neutron gas rapidly until a density of 10 tons per cubic inch is reached; at this point the strong nuclear force resists further contraction. If the mass of the star was between 1.4 and a few solar masses, the process stops here, and we have a neutron star. But if the original star was more massive than a few solar masses, even the strong nuclear forces cannot resist the gravitational orunch. The neutrons are forced into one another to form heavier hadrons and these in turn coalesce to form heavier entities, of which we as yet know nothing. At this point, a complete collapse of the stellar mass occurs; existing theories predict a collapse to infinite density and infinitely small dimensions Well before this, however, the surface gravitational force would become so strong that no signal could ever leave the star - any photon emitted would fall back under gravitational attraction – and the star would become black hole in space. This gravitational collapse poses a fundamental challenge to physics. When the most widely accepted theories predict such improbable things as infinite density and infinitely small dimensions, it simply means that we are missing some vital insight. This last happened in physics in the 1930's, when we faced the fundamental paradox concerning atomic structure. At that time, it was recognized that electrons moved in table orbits about nuclei in atoms. However, it was also recognized that if charge is accelerated, as it must be to remain in orbit, it radiates energy; so, theoretically, the electron would be expected eventually to spiral into the nucleus and destroy the atom. Studies centered around this paradox led to the development of quantum mechanics. It may well be that an equivalent t advance awaits us in investigating the theoretical problems presented by the phenomenon of gravitational collapse. According to the passage, in the final stages of its development our own sun is likely to take the form of a

- A. white dwarf
- B. neutron star
- C. red giant
- D. gas of free neutrons
- E. black hole

Answer: A

Question: 12

The discoveries of the white dwarf, the neutron star, and the black hole, coming well after the discovery of the red giant are among eh most exciting developments in decades because they may be well present physicists with their greatest challenge since the failure of classical mechanics. In the life cycle of the star, after all of the hydrogen and helium fuel has been burned, the delicate balance between the outer nuclear radiations. Pressure and the stable gravitational force becomes disturbed and slow contraction begins. As compression increases, a very dense plasma forms. If the initial star had mass of less than 1.4 solar masses (1.4 times the mass of our

sun), the process ceases at the density of 1,000 tons per cubic inch, and the star becomes the white dwarf. However, if the star was originally more massive, the white dwarf plasma can't resist the gravitational pressures, and in rapid collapse, all nuclei of the star are converted to a gas of free neutrons. Gravitational attraction compresses this neutron gas rapidly until a density of 10 tons per cubic inch is reached; at this point the strong nuclear force resists further contraction. If the mass of the star was between 1.4 and a few solar masses, the process stops here, and we have a neutron star. But if the original star was more massive than a few solar masses, even the strong nuclear forces cannot resist the gravitational crunch. The neutrons are forced into one another to form heavier hadrons and these in turn coalesce to form heavier entities, of which we as yet know nothing. At this point, a complete collapse of the stellar mass occurs; existing theories predict a collapse to infinite density and infinitely small dimensions. Well before this, however, the surface gravitational force would become so strong that no signal could ever leave the star - any photon emitted would fall back under gravitational attraction - and the star would become black hole in space. This gravitational collapse poses a fundamental challenge to physics. When the most widely accepted theories predict such improbable things as infinite density and infinitely small dimensions, it simply means that we are missing some vital insight. This last happened in physics in the 1930's, when we faced the fundamental paradox concerning atomic structure. At that time, it was recognized that electrons moved in stable orbits about nuclei in atoms. However, it was also recognized that if charge is accelerated, as it must be to remain in orbit, it radiates energy; so, theoretically, the electron would be expected eventually to spiral into the nucleus and destroy the atom. Studies centered around this paradox led to the development of quantum mechanics. It may well be that an equivalent advance awaits us in investigating the theoretical problems presented by the phenomenon of gravitational collapse. According to the passage, an imbalance arises between nuclear radiation pressure and gravitational force in stars because

- A. the density of a star increases as it ages
- B. radiation pressure increases as a star increases in mass
- C. radiation pressure decreases when a star's fuel has been consumed
- D. the collapse of a star increases its gravitational force.
- E. dense plasma decreases the star's gravitational force.

Answer: C

Question: 13

The discoveries of the white dwarf, the neutron star, and the black hole, coming well after the discovery of the red giant are among the most exciting developments in decades because they may be well present physicists with their greatest challenge since the failure of classical mechanics. In the life cycle of the star, after all of the hydrogen and helium fuel has been burned, the delicate balance between the outer nuclear radiations. Pressure and the stable gravitational force becomes disturbed and slow contraction begins. As compression increases, a very dense plasma forms. If the initial star had mass of less than 1.4 solar masses (1.4 times the mass of our sun), the process ceases at the density of 1,000 tons per cubic inch, and the star becomes the white dwarf. However, if the star was originally more massive, the white dwarf plasma can't resist the gravitational pressures, and in rapid collapse, all nuclei of the star are converted to a gas of

free neutrons. Gravitational attraction compresses this neutron gas rapidly until a density of 10 tons per cubic inch is reached; at this point the strong nuclear force resists further contraction. If the mass of the star was between 1.4 and a few solar masses, the process stops here, and we have a neutron star. But if the original star was more massive than a few solar masses, even the strong nuclear forces cannot resist the gravitational crunch. The neutrons are forced into one another to form heavier hadrons and these in turn coalesce to form heavier entities, of which we as yet know nothing. At this point, a complete collapse of the stellar mass occurs; existing theories predict a collapse to infinite density and infinitely small dimensions. Well before this, however, the surface gravitational force would become so strong that no signal could ever leave the star - any photon emitted would fall back under gravitational attraction - and the star would become black hole in space. This gravitational collapse poses a fundamental challenge to physics. When the most widely accepted theories predict such improbable things as infinite density and infinitely small dimensions, it simply means that we are missing some vital insight. This last happened in physics in the 1930's, when we faced the fundamental paradox concerning atomic structure. At that time, it was recognized that electrons moved in table orbits about nuclei in atoms. However, it was also recognized that if charge is accelerated, as it must be to remain in orbit, it radiates energy; so, theoretically, the electron would be expected eventually to spiral into the nucleus and destroy the atom. Studies centered around this paradox led to the development of quantum mechanics. It may well be that an equivalent advance awaits us in investigating the theoretical problems presented by the phenomenon of gravitational collapse. The author asserts that the discoveries of the white dwarf, the neutron star, and the black hole are significant because these discoveries.

- A. demonstrate the probability of infinite density and infinitely small dimensions
- B. pose the most comprehensive and fundamental problem faced by physicists in decades
- C. clarify the paradox suggested by the collapse of electrons into atomic nuclei.
- D. establish the relationship between the mass and gravitational pressure.
- E. assist in establishing the age of the universe by tracing the life histories of stars.

Answer: B

Question: 14

The discoveries of the white dwarf, the neutron star, and the black hole, coming well after the discovery of the red giant are among the most exciting developments in decades because they may be well present physicists with their greatest challenge since the failure of classical mechanics. In the life cycle of the star, after all of the hydrogen and helium fuel has been burned, the delicate balance between the outer nuclear radiations. Pressure and the stable gravitational force becomes disturbed and slow contraction begins. As compression increases, a very dense plasma forms. If the initial star had mass of less than 1.4 solar masses (1.4 times the mass of our sun), the process ceases at the density of 1,000 tons per cubic inch, and the star becomes the white dwarf. However, if the star was originally more massive, the white dwarf plasma can't resist the gravitational pressures, and in rapid collapse, all nuclei of the star are converted to a gas of free neutrons. Gravitational attraction compresses this neutron gas rapidly until a density of 10 tons per cubic inch is reached; at this point the strong nuclear force resists further contraction. If the mass of the star was between 1.4 and a few solar masses, the process stops here, and we

have a neutron star. But if the original star was more massive than a few solar masses, even the strong nuclear forces cannot resist the gravitational crunch. The neutrons are forced into one another to form heavier hadrons and these in turn coalesce to form heavier entities, of which we as yet know nothing. At this point, a complete collapse of the stellar mass occurs; existing theories predict a collapse to infinite density and infinitely small dimensions. Well before this, however, the surface gravitational force would become so strong that no signal could ever leave the star - any photon emitted would fall back under gravitational attraction - and the star would become black hole in space. This gravitational collapse poses a fundamental challenge to physics. When the most widely accepted theories predict such improbable things as infinite density and infinitely small dimensions, it simply means that we are missing some vital insight. This last happened in physics in the 1930's, when we faced the fundamental paradox concerning atomic structure. At that time, it was recognized that electrons moved in table orbits about nuclei in atoms. However, it was also recognized that if charge is accelerated, as it must be to remain in orbit, it radiates energy; so, theoretically, the electron would be expected eventually to spiral into the nucleus and destroy the atom. Studies centered around this paradox led to the development of quantum mechanics. It may well be that an equivalent advance awaits us in investigating the theoretical problems presented by the phenomenon of gravitational collapse. The passage contains information that answers which of the following questions?

- A. I only
- B. III only
- C. I and II only
- D. II and III only
- E. I, II and III

Answer: E

Question: 15

The discoveries of the white dwarf, the neutron star, and the black hole, coming well after the discovery of the red giant are among the most exciting developments in decades because they may be well present physicists with their greatest challenge since the failure of classical mechanics. In the life cycle of the star, after all of the hydrogen and helium fuel has been burned, the delicate balance between the outer nuclear radiations. Pressure and the stable gravitational force becomes disturbed and slow contraction begins. As compression increases, a very dense plasma forms. If the initial star had mass of less than 1.4 solar masses (1.4 times the mass of our sun), the process ceases at the density of 1,000 tons per cubic inch, and the star becomes the white dwarf. However, if the star was originally more massive, the white dwarf plasma can't resist the gravitational pressures, and in rapid collapse, all nuclei of the star are converted to a gas of free neutrons. Gravitational attraction compresses this neutron gas rapidly until a density of 10 tons per cubic inch is reached; at this point the strong nuclear force resists further contraction. If the mass of the star was between 1.4 and a few solar masses, the process stops here, and we have a neutron star. But if the original star was more massive than a few solar masses, even the strong nuclear forces cannot resist the gravitational crunch. The neutrons are forced into one another to form heavier hadrons and these in turn coalesce to form heavier entities, of which we as yet know nothing. At this point, a complete collapse of the stellar mass occurs; existing

theories predict a collapse to infinite density and infinitely small dimensions. Well before this, however, the surface gravitational force would become so strong that no signal could ever leave the star - any photon emitted would fall back under gravitational attraction - and the star would become black hole in space. This gravitational collapse poses a fundamental challenge to physics. When the most widely accepted theories predict such improbable things as infinite density and infinitely small dimensions, it simply means that we are missing some vital insight. This last happened in physics in the 1930's, when we faced the fundamental paradox concerning atomic structure. At that time, it was recognized that electrons moved in table orbits about nuclei in atoms. However, it was also recognized that if charge is accelerated, as it must be to remain in orbit, it radiates energy; so, theoretically, the electron would be expected eventually to spiral into the nucleus and destroy the atom. Studies centered around this paradox led to the development of quantum mechanics. It may well be that an equivalent t advance awaits us in investigating the theoretical problems presented by the phenomenon of gravitational collapse.

The author introduces the discussion of the paradox concerning atomic structures in order to

- A. Show why it was necessary to develop quantum mechanics
- B. Compare the structure of an atom with the structure of star
- C. Demonstrate by analogy that a vital insight in astrophysics is missing
- D. illustrate the contention that improbable things do happen in astrophysics
- E. Argue that atoms can collapse if their electrons do not remain in orbit.

Answer: C
