

Consider the following information and answer questions 1 and 2.

From the study of the cell structures of 4 cell types (a, b, c and d) the results are shown in the table below.

Cell types	Cell structures				
	Cell wall	Cytoskeleton	Plasma membrane	Ribosome	Chloroplast
a	/	/	/	/	/
b	/	x	/	/	x
c	/	/	/	/	x
d	x	/	/	/	/

Note: / = Found x = Not found

1. The information from the table above, which cell is likely to be a plant cell?

- A. a
- B. a, b
- C. a, c
- D. a, b, c, d

2. If bacterial cells were included in this study, which cell would be the bacterial cell?

- A. b
- B. c
- C. d
- D. Insufficient information

3. Which of the following is a cell component that is responsible for producing insulin?

- a. Lysosome
- b. Smooth endoplasmic reticulum
- c. Rough endoplasmic reticulum
- d. Golgi body
- e. Free ribosome

A. a, b

B. c, d

C. a, c, e

D. b, c, d

4. When onion root tip cells are immersed in 0.85% NSS, what will happen?

- A. Plasmolysis occurs because this solution is a Hypotonic solution.
- B. Crenation occurs because this solution is a Hypertonic solution.
- C. No changes occur to the cells because this solution is an Isotonic solution.
- D. No changes occur in the cells because the cell wall maintains the cell structure even with very low osmotic pressure.

Consider the following statements and answer questions 5 and 6.

A man wants to test 3 randomly collected food samples (a, b and c) to determine the nutritional composition of the food samples. The test results are shown in the table below.

Food kinds	Testing results		
	Iodine solution	Benedict solution	Biuret solution
a	Brown	Red-brick sediment	Violet solution
b	Blue	Red-brick sediment	Light blue solution
c	Blue	Light blue solution	Light blue solution

5. If you need food with a high protein content, which type of food would be most suitable?

- A. a
- B. b
- C. c
- D. Insufficient information

6. If a woman has diabetes, which food or foods should she avoid the most?

- A. a
- B. b
- C. a, c
- D. b, c

7. Consider the following choices.

- | | |
|---------------|------------|
| a. Hemoglobin | b. Insulin |
| c. Pepsinogen | d. Keratin |
| e. Collagen | |

Which of the following has the correct order of protein structure (primary structure to quaternary structure)?

- A. a, b, c, d
- B. b, d, c, e
- C. c, a, e, b
- D. d, e, b, c

8. Consider the following statement.

- a. Glucose - glycosidic bond
- b. Actin - peptide bond
- c. Fat - ester bond

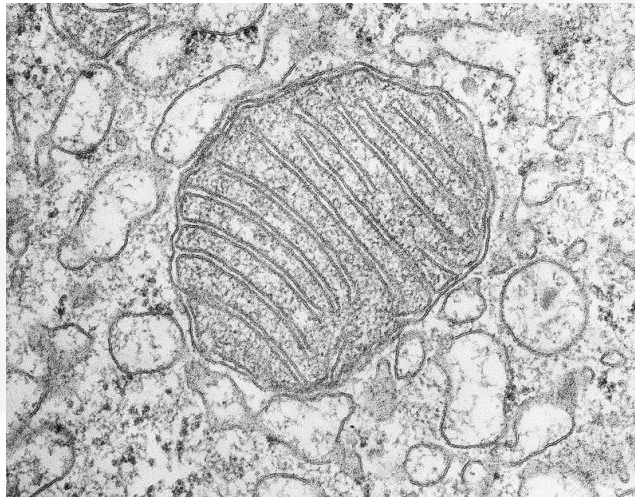
Which of the following is an incorrect relationship?

- A. a
- B. b
- C. a, b
- D. b, c

9. When one uses a microscope with an objective lens of 10X to look at the scale on a ruler. It was found that the length of the ruler passing through the center is 4 millimeters. If the objective lens was changed to 4X, what would be the length of the ruler passing through the center?

- A. 2 mm
- B. 6 mm
- C. 8 mm
- D. 10 mm

10. Consider the following statements about the picture below.



- a. This is an image from a transmission electron microscope.
- b. This is an image from a scanning electron microscope.
- c. The organelles shown in the picture are found in both plant and animal cells.
- d. The organelles in the image contain the same genetic material as those in the nucleus.

Which statement is correct about the picture?

- A. a, c
- B. b, c
- C. a, d
- D. b, d

11. Soft tissue sarcoma is a cancer that occurs in groups of soft tissue organs that are under the skin, such as fat lumps, muscles, blood vessels, nerves, etc. It is a rare cancer and is not widely known. However, it can affect the quality of life of patients if they see a doctor and receive cancer treatment late. Each type has a different diagnosis and treatment. The initial symptoms of the disease are lumps in various parts, such as the arms, legs, or torso. These lumps will gradually grow larger and do not move with body movement. They may or may not be painful. However, if there is a wound, it will be a chronic wound that does not heal or a bruise that is swollen and growing more and more. It is most found in the arms and legs, followed by the torso and head and neck, respectively. From the above description, which of the following statements is incorrect about the treatment of this type of cancer?

- A. Surgical treatment may be combined with adjuvant radiation therapy.
- B. Radiation therapy may be the mainstay of treatment for inoperable metastatic tumors.
- C. Radiation therapy for sarcoma often uses the same dose because they are all in the same cancer group.
- D. Currently, there is no way to absolutely prevent soft tissue sarcoma.

12. Diabetes is a disease caused by abnormalities in the functioning of a hormone called "Insulin". Normally, our bodies need insulin to bring sugar from the bloodstream into the cells of various organs of the body, especially the brain and muscles. When insulin is abnormal, whether it is a decrease in the amount of insulin in the body or the organs of the body responding less to insulin, or what is called "Insulin resistance", the body will not be able to use the sugar in the bloodstream effectively, resulting in more sugar remaining in the bloodstream than normal. From this article, which of the following additional statements most accurately describes the abnormalities of the body that are the cause of insulin deficiency?

- A. It is a disorder in which cells in the acinar cells in the pancreas are unable to produce the enzyme that stimulates insulin production.
- B. It is a disorder in which alpha cells in the pancreas are unable to produce insulin in response to the amount of high sugar in the bloodstream.
- C. It is a disorder in which both beta and alpha cells in the pancreas fail to respond to commands from the hypothalamus.

D. It is a disorder in which beta cells in the pancreas are unable to produce insulin in response to the amount of high sugar in the bloodstream.

Consider the following passage and answer questions 13 - 16.

Cyanide is a fast-acting, dangerous chemical that can cause cells unable to use oxygen, which can lead to fatality. Cyanide occurs naturally in various plants, such as apricot kernels and black cherries, and in linamarin, which is found in cassava tubers and leaves. Some kinds of metabolism in the human body can also produce cyanide.

Cyanide can enter the body in several ways, including direct contact, inhalation, and ingestion. Symptoms after exposure to cyanide include irritation of the affected area such as skin or eyes, weakness, dizziness, nausea, difficulty breathing, unconsciousness, and cardiac arrest. The severity of the symptoms may depend on the types of cyanide, the amount, and the exposure time.

Cyanide is a toxic substance that inhibits cellular respiration, preventing cells from using oxygen in producing energy. Therefore, it affects the organs that use a lot of oxygen and energy first. If a large enough amount of the toxic substance is ingested, it can cause sudden death, regardless of the method of ingestion.

13. Based on the above information, which organelle within the cell is likely to have a direct effect on cyanide?

- A. Nucleus
- B. Ribosome
- C. Mitochondria
- D. Golgi complex

14. Based on the above information, which of the following organs is immediately affected by cyanide poisoning?

- a. Brain
- b. Heart
- c. Lung
- d. Liver
- e. Kidney

- A. a, b
- B. a, b, c
- C. a, b, c, d
- D. a, b, c, d, e

15. From the information above, which of the following is incorrect?

- A. If cyanide is exposed through skin contact, the body can be cleaned with soap and water to reduce the amount of toxicity exposed
- B. If cyanide is ingested and the patient has difficulty breathing or has stopped breathing, CPR with mouth-to-mouth resuscitation must be performed to provide first aid and the patient must be rushed to the hospital.
- C. If cyanide is exposed to the eyes, flush the eyes with clean water for at least 10 minutes and go to the hospital for treatment.
- D. There is no mistake, as all of the above can be applied.

16. From the information above, which of the following statements is incorrect regarding the laboratory determination of cyanide levels in blood?

- A. Metabolic acidosis of the blood was detected.
- B. Hyperoxia of the blood was detected.
- C. Hyperglycemia of the blood was detected.
- D. Hyperlactatemia of the blood was detected.

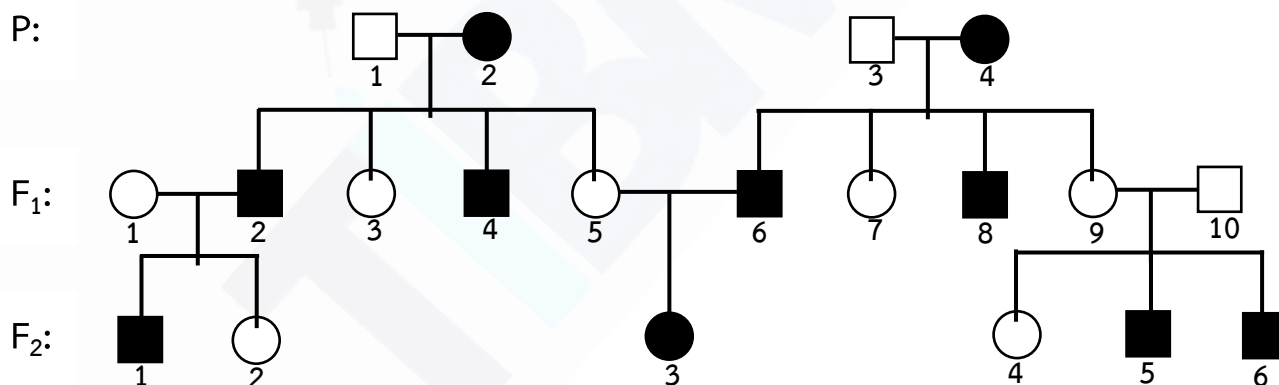
17. Consider the following statement.

- Normal cells gradually stop dividing because they sense that they are surrounded by other cells on all sides.
- Cancer cells will continue to divide even if they have unstable genetic.
- Most cells in the body do not divide continuously but perform normal functions.
- Cancer cells have a limit on the number of times they can divide, but they can divide many times more than normal cells in the same group.

Which of the following statements is correct regarding normal cell division and cancer cell division?

- a, b
- a, c
- a, b, c
- a, b, c, d

Use the pedigree below for questions 18 – 20.



18. From the diagram above, what type of inheritance is the trait represented by black?

- It is inheritance through dominant genes on autosome.
- It is inheritance through dominant genes on X-chromosome.
- It is inheritance through recessive genes on autosome.
- It is inheritance through recessive genes on X-chromosome.

19. Which of the following is like the genetic inheritance pattern shown in the diagram above?

- A. Thalassemia, albinism
- B. Hemophilia, albinism
- C. Red-green colorblindness, hemophilia
- D. Hemophilia, polydactyly

20. Who has a heterozygous condition?

- A. P_1 , F_1 -7
- B. F_1 -1, F_2 -2
- C. P_2 , F_2 -3
- D. F_1 -7, F_2 -5

Consider the following passage and answer questions 21 – 23.

“Gene therapy” is a medical approach that uses genetic material to prevent and treat disease. This technique allows healthcare providers to treat certain diseases by altering their genetic structures, rather than using traditional treatments such as medicines or surgery.

In gene therapy, genetic material is transferred into a recipient's cells. This genetic material then changes the way the cell makes proteins, which can result in lower levels of certain disease-causing proteins, increased production of needed proteins, or creation of new or modified functionable proteins for use within the cell.

Gene therapy works by replacing or depressing the expression of a disease-causing gene, or replacing a damaged (mutated) gene, causing the mutated gene to stop working, or creating a new gene to replace it.

21. From the paragraph above, which of the following statements is incorrect regarding the benefits of gene therapy?

- A. Gene therapy is an alternative treatment that has no side effects, so studies and research are being conducted to increase the variety of gene patterns used.

B. If gene therapy is given early in treatment, damage can be prevented before it occurs, but further studies and research are needed to demonstrate the extent to which gene therapy can reverse the damage.

C. Gene therapy can determine target treatments directly to abnormal genes in your body.

D. Gene therapy could help slow or even stop the progression of new treatments for diseases for which there are currently few alternatives.

22. Genes used in therapy are delivered into cells by carriers, also called “vectors”. These vectors can pass through the cells and allow the genes to integrate into the cellular genetic material. What does “vector” mean?

A. Solutions

B. Bacterial

C. Plasmids

D. Viral

23. Gene therapy can be applied to treat the following diseases except which one?

A. Thalassemia

B. Sickle cell anemia

C. Down’s syndrome

D. Duchenne muscular dystrophy

24. Which of the following is incorrect?

A. *Homo ergaster* was great skilled at creating sophisticated weapons and tools.

B. *Homo erectus* was able to communicate by speaking and was the first human species to invent fire and build shelters.

C. *Homo erectus* was the first primitive human species to migrate out of Africa, and is therefore found in areas such as Peking Man and Java Man.

D. None of the above

25. Consider the following statement.

- a. Simple squamous epithelium is located within blood vessels and spaces in the body and functions to control the flow of substances into lower tissues.
- b. Simple columnar epithelium is found in the stomach and intestines, it is involved in absorption and often has cilia or microvilli on the upper cell surface.
- c. Transitional epithelium is a specialized type of epithelial tissue found in flexible organs, such as the bladder and urethra.

Which statement is most correct?

- A. a, b
- B. b, c
- C. a, c
- D. a, b, c

26. Consider the following statement.

- a. HCl acidifies the stomach contents adjusting the acid-base environment to be suitable for converting trypsinogen to trypsin.
- b. Enterokinase is an enzyme produced by organs that do not digest any nutrients, but are important in the production of substances necessary for digestion, such as the enzyme NaHCO_3^- .
- c. The organ that produces trypsinogen is also capable of producing hormones that are important in sugar metabolism.
- d. Amino acids and fatty acids have the same absorption pathway in the small intestine.

Which statement is incorrect about the digestive system?

- A. a, b, c
- B. a, b, d
- C. b, c, d
- D. a, b, c, d

27. The organs in the following choices are considered in the same organ system except which one?

- A. Spleen, Tonsils, Lymph nodes
- B. Stomach, Pancreas, Small intestine
- C. Pancreas, Thyroid, Testicles
- D. Lungs, Kidneys, Large intestine

28. Consider the following statement.

- a. The sinoatrial node (SA node) is a group of cells located on the wall of the right atrium near the entrance of the superior vena cava. They are the first pacemaker cells.
- b. The atrioventricular node (AV node) is found between the left atrium and right ventricle within the atrial septum and is the second pacemaker cell.
- c. The carotid artery is a large artery in the neck that carries high oxygenated blood to the head and returns low oxygenated blood to the heart via the carotid vein.
- d. Atherosclerosis is a condition in which the inner walls of blood vessels thicken over time due to the accumulation of fat between the blood vessels, eventually causing the blood vessels to become blocked, which is the cause of symptoms in various organs and can cause ischemia.

Which statement is most correct?

- A. a, b
- B. b, c
- C. a, b, c
- D. a, b, d

Consider the following passage and answer questions 29 – 31.

Coronaviruses are single-stranded RNA viruses in the Coronaviridae family. They have been reported since 1965 and can infect humans and animals such as chickens, cows, buffaloes, dogs, and cats. Viruses in this group consist of several subtypes and cause symptoms in various systems such as the respiratory system, gastrointestinal system, nervous system, or other systems.

The coronavirus pandemic is a global outbreak of an infectious disease caused by a novel coronavirus 2, or SARS-CoV-2. Cases of the novel coronavirus were first detected in China in December 2019. The virus has spread rapidly to other countries around the world, prompting the WHO to declare a public health emergency of international concern on January 30, 2020.

And on February 12, 2020, the World Health Organization announced the official name for the respiratory disease caused by the new coronavirus as "Covid-19". This name comes from the English abbreviation of the word including coronavirus, virus, and disease, as well as the number 19, representing the year the outbreak was first reported.

The Covid-19 virus is a virus with a lipid layer surrounding it, or what is called an envelope. These viruses are called enveloped viruses. The envelope of the virus has a protrusion from the envelope called a “spike”, which may have the properties of a substance or an enzyme.

29. The symptoms of Covid-19 infection are similar to the symptoms of which disease?

- A. Acquired Immune Deficiency Syndrome
- B. Severe acute respiratory syndrome
- C. Ebola – Marburg viral disease
- D. Lymphadenitis

30. What role does the spike on the virus's capsid play?

- A. Used to evade immune system detection.
- B. Used to distribute genetic material into bodily fluids.
- C. Used to attach to the cell surface receptors.
- D. Used to cut the genetic material of cells to insert the viral genetic material.

31. Which of the following is incorrect?

- A. PCR is a method used to detect the presence of a virus by comparing it to a known fragment of the coronavirus SARS-CoV-2.
- B. There are many other coronaviruses that can cause illness, ranging from the common cold to more severe diseases such as MERS and SARS.
- C. Since the SARS-CoV-2 coronavirus has a lipid shell, it is resistant to environmental conditions, making it difficult to destroy by heat or sunlight. This is why washing your hands with soap and alcohol-based hand rubs can eliminate this virus.
- D. Once the virus enters a cell, new RNA is rapidly created, while the host cell also helps create proteins to envelop the new RNA and assemble it into a virus.

32. “Gonorrhea” is a type of sexually transmitted disease that can be found in both women and men. Although gonorrhea does not have a vaccine to prevent it like other diseases such as the HPV vaccine, this disease is divided into 2 groups: gonorrhea and non-gonococcal urethritis, but this disease can be cured. However, if it is not treated correctly, gonorrhea can spread to the point of causing complications. From the article above, which of the following is incorrect? It must be related to gonorrhea.

- A. There are several ways to test for gonorrhea infection, including by taking a sample of cervical discharge, a urine test in men, or a blood sample.
- B. Gonorrhea is caused by *Neisseria gonorrhoeae*, which live in the genitals, anus, or mouth. It is primarily transmitted through sexual contact.
- C. A non-gonococcal urethritis is caused by *Chlamydia trachomatis*, which is found in semen and vaginal mucosa. It is primarily transmitted through sexual contact.
- D. If the mother has gonorrhea infection, it may cause conjunctivitis in the baby.

Consider the following passage and answer questions 33 - 34.

West Nile virus is another member of the Flavivirus family of single-stranded RNA viruses that can cause encephalitis, acute fever with a rash, swollen lymph nodes, and joint symptoms.

In August 1999, there was an outbreak of encephalitis from West Nile virus infection in the United States. It began in New York State, causing 58 cases of encephalitis and 6 deaths. The virus was mostly found in birds, and it is believed that birds may have spread the disease, all of which were found at the Bronx Zoo in New York.

The West Nile virus outbreak killed more than 560 Americans in New York City, and more than 80% of those infected showed no signs and symptoms. West Nile virus outbreaks continue to occur in the United States from time to time and are a major public health problem.

33. From this article, which statement is incorrect?

- A. The worrying point of this virus outbreak is that most infections are asymptomatic, making it difficult to deal with.
- B. This disease is transmitted by the Culex Mosquito, also known as the encephalitis mosquito.
- C. Birds are a carrier of viruses.
- D. All are correct.

34. If classify this virus by using its genetic material types, which of the following viruses should West Nile virus belong to?

- A. Adenovirus, Dengue virus
- B. Japanese B virus, Dengue virus
- C. Japanese B virus, Hepatitis B virus
- D. Adenovirus, Hepatitis B virus

35. When the body is infected with a virus, the body can respond to the infection in many ways. Which of the following statements is incorrect regarding the body's response to viral infection?

- A. Natural Killer cells or NK cells destroy cells infected with viruses.
- B. Produce specific antibodies that bind to virus-infected particles and cells, inducing the associated white blood cells to destroy them.
- C. Interferon is a cytokine that the body releases when infected with various pathogens to inhibit the multiplication of viruses and stimulate cells in the immune system.
- D. T-helper (CD4+) is a lymphocyte that is responsible for directly destroying cells infected with viruses.

36. A man wants to lose weight, so he chooses to eat foods that have a limited amount of fat, protein and salt each day. One day, the man wants to eat a dessert, but it must meet the following conditions:

- Salt content not exceeding 0.7 grams
- Fat content not exceeding 40 grams
- Protein content of at least 6 grams

The table below shows the nutritional information of the dessert that the man is interested in eating.

	Energy (kcal)	Salt (mg)	Fat (g)	Protein (g)	Carbohydrate (g)
Egg tart	3200	350	38	5	58
Chocolate Sundae	4030	700	69	4	93
Rocky Road Sunday	3300	300	29	8	88
Creme Brulee	1235	100	20	5	87
Chocolate Brownies	3230	135	32	7	95

Given that this man wants to eat a low-calorie dessert for weight loss purposes, find out how many carbohydrates and calories his dessert selection contains (respectively).

- A. 58, 3200
- B. 87, 1235
- C. 88, 3300
- D. 95, 3230

Consider the following passage and answer questions 37 - 38.

Monkeypox is caused by the Orthopoxvirus, a double-stranded DNA virus from the same group as smallpox. It was first discovered in 1958 from studying infected monkeys. The first infection in humans was found in 1970 in the Republic of Congo. After that, it was found in countries in Central and West Africa, with the most infected being the Republic of Congo and Nigeria.

Since 2018, more cases have been reported outside Africa, and in May 2022, several cases were reported from countries outside Africa. Although no deaths have been reported, this has led to interest in studying monkeypox to prevent a wider outbreak.

Monkeypox virus is found in many animals, especially primates and rodents, including humans. The incubation period before symptoms appear is about 5-21 days, but most people show symptoms within 10-14 days.

Despite its similar appearance and symptoms to smallpox, monkeypox is generally less severe. Most patients recover within 2–4 weeks. The overall mortality rate is approximately 0–11%, and most cases occur in children. Furthermore, the mortality rate has recently decreased to 3–6%, with children, adolescents, and immunocompromised individuals at higher risk.

37. From the above article, which of the following statements is incorrect?

- A. Monkeypox will continue to have a high prevalence and mortality rate due to the changing nature of the outbreak. Therefore, close surveillance and monitoring of data are necessary.
- B. Diagnosis by sending specimens for PCR should specify the patient's symptoms and duration of disease along with the specimens. People who have been vaccinated against this group of organisms may have false positive results.
- C. Monkeypox can be transmitted through contact with the blood, secretions, respiratory tract or wounds of infected animals, as well as through eating undercooked meat of infected animals.
- D. Monkeypox virus is a virus in the same genus as the virus used to produce the human smallpox and cowpox vaccines.

38. Which of the following people is at risk of contracting monkeypox except?

- A. Medical staffs
- B. Researchers conducting research on monkeypox
- C. People who have sexual activity with an infected person
- D. People who live in or have traveled to areas with outbreaks, such as in the United States and Europe.

39. Consider the following statement.

- a. Hyperinsulinemia is a condition in which the cells are unable to respond to insulin effectively. Therefore, even though there is a high amount of insulin, blood sugar levels remain high.
- b. Hyperthyroidism is a thyroid disorder in which the thyroid gland is overactive, causing the level of calcitonin hormone in the blood to be too high, resulting in the cells in body working more than normal.
- c. Contraceptive pills are drugs that contain the hormones estrogen and progesterone. They have the properties of inhibiting ovulation, changing the lining of the uterus to make it less suitable for implantation of an embryo, and affecting the movement of the fallopian tubes, preventing the egg from traveling to the uterus.
- d. Cretinism is a group of symptoms caused by a deficiency of growth hormone in children, resulting in physical, brain, nervous system, and intellectual abnormalities in children.

Which statement is incorrect?

- A. a, c
- B. b, d
- C. a, b, c
- D. b, c, d

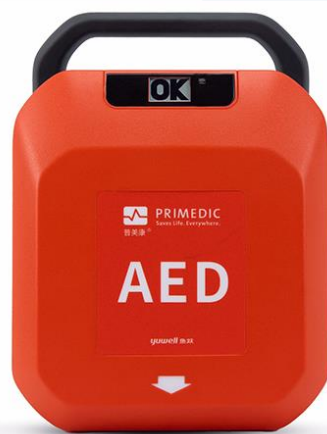
40. Consider the following statement.

- a. Myometrium is the innermost layer of tissue in the uterine wall that thickens during menstruation and is shed as menstrual blood if no embryo implants.
- b. The hormone that has the greatest effect on changes in the thickness of the inner uterine wall is progesterone.
- c. The female hormones, estrogen and progesterone, therefore, only affect females.

Which statement is most correct?

- A. a
- B. b
- C. a, c
- D. a, b, c

41. What is the use of the equipment shown in the picture below?



- A. A portable and wearable electrocardiogram device to record heartbeats and detect abnormal heart rhythms.
- B. Defibrillation therapy can be used to defibrillate the heart, using an electrical current to stop the abnormal heart rhythm, giving the heart a chance to start beating in the normal rhythm.
- C. Used to suction fluids and thick mucus from the patient's respiratory tract to reduce the mucus blocking the respiratory system and bronchi and reduce the risk of respiratory failure.
- D. It is a type of medical device that is part of oxygen therapy if patients have an illness that affects their lungs or have difficulty breathing.

42. What does the symbol of the image below mean?



A.	The Caduceus	A healthcare symbol
B.	The Rod of Asclepius	The true nursing symbol of healing
C.	The Star of Life	Emergency Medical Services
D.	Biohazard	Warning people of infectious bodily fluids and other biological dangers.

1.	C
2.	A
3.	B
4.	C
5.	A
6.	B
7.	B
8.	A
9.	D
10.	A
11.	C
12.	D
13.	C
14.	A
15.	B
16.	C
17.	C
18.	D
19.	C
20.	B
21.	A

22.	D
23.	C
24.	D
25.	D
26.	B
27.	D
28.	D
29.	B
30.	C
31.	C
32.	A
33.	D
34.	B
35.	D
36.	D
37.	A
38.	D
39.	B
40.	B
41.	B
42.	A