

Science 12



Complete Workbook

- ★ Aligned with Alberta curriculum
- ★ Contains Science 30 practice questions and answers

2020 EDITION

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Unit 1: Living Systems in the Environment

1. You accidentally cut your finger with a knife in the kitchen. Which of the following blood components plays a key role in healing the cut?
A) Plasma
B) Platelets
C) Red blood cells
D) White blood cells

Immune System Responses

- I B-cells are instructed to produce antibodies
 - II Macrophages absorb foreign body and produce antigen markers
 - III Antibodies attach to foreign invaders
 - IV Helper T-cells identify the antigens on the macrophages
- 2.

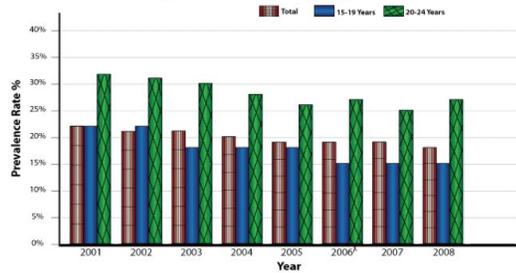
The correct sequence that occurs as the body's response to an attacking invader is

- A) I, II, III, IV
 - B) IV, II, III, I
 - C) II, IV, I, III
 - D) II, III, IV, I
3. Certain drugs which are made of proteins have to be injected into the blood instead of ingested in the stomach. This is because
A) the stomach has a low pH
B) the stomach has a high pH
C) blood has a neutral pH
D) the concentration needs to be lower
 4. Which of the following would be considered one of the body's first lines of defence against infection?
A) Tears
B) Red blood cells
C) Platelets

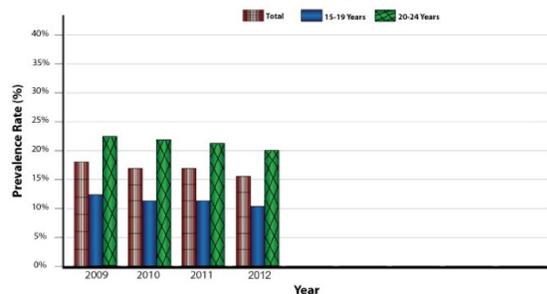
D) Killer T-cells

5. All of the following are risk factors of cardiovascular disease EXCEPT:
A) Smoking
B) Diet high in protein
C) High blood pressure
D) Family history of cardiovascular disease
6. A blood vessel is called an artery if it carries
A) blood away from the heart
B) blood towards the heart
C) oxygenated blood
D) deoxygenated blood
7. The reason that the site of injections should be cleansed with alcohol is that the alcohol will
A) suppress the immune system
B) help the puncture wound to heal
C) kill any bacteria near the puncture
D) stop the pain receptors from firing
8. A red flower is crossed with a white flower. The resulting offspring is a pink flower. Which of the following statements is correct regarding the genetics of this cross?
A) The pink allele is dominant.
B) This is a case of codominance.
C) The phenotype of one parent is red.
D) The genotype of the offspring is pink.
9. Use the following data charts to answer this question.

Current Smoking Prevalence by Age, Canada, 2001-2008



Current Smoking Prevalence by Age, Canada, 2009-2012



Which of the following is a correct interpretation of the data charts on smoking prevalence in Canada?

- A) The overall rate of smoking declined between 2001 and 2012.
- B) The number of smokers will continue to decline from 2012 to 2018.
- C) The majority of smokers in Canada are between the ages of 20 to 24 years old.
- D) In 2001, the total number of smokers is equal to the number of smokers in the 15 to 19 years category.

10. Nolan has 3 cups of caffeinated coffee in order to stay awake and study for his exam. His heart rate is most likely to:

- A) double
- B) increase
- C) decrease
- D) stay the same

11. When the structure of a gene changes, this is called a:

- A) haploid.
- B) disjunction.
- C) free radical.
- D) mutation.

12. A computer simulation was set up to model the immune response to the first exposure of a respiratory virus. What is the first step that would occur in the nonspecific immune response?

- A) Helper T cells are activated.
- B) Macrophages engulf the virus.
- C) Mucous membranes trap the virus.
- D) Antibodies attach to antigens on the virus.

13. A red flower is crossed with a white flower. The resulting offspring is a pink flower. Which of the following statements is correct regarding the genetics of this cross?

- A) The pink allele is dominant.
- B) This is a case of codominance.
- C) The phenotype of one parent is red.
- D) The genotype of the offspring is pink.

14. A heart dissection was performed in class. Which of the following statements describe actual dissection observations?

- A) Fatty tissue is observed outside the heart.
- B) Coronary arteries are observed inside the heart.
- C) The right side of the heart feels more muscular than the left side.
- D) Orient the heart by placing the ventricles towards the top of your tray.

15. This pedigree chart depicts the X-linked recessive inheritance pattern of colour blindness. The father is colour blind and

the mother is not a carrier of the colour-blind trait.

Which of the following statements is correct regarding the interpretation of the children in the pedigree chart?

- A) All children are carriers.
- B) Both sons are colour blind.
- C) Both daughters are carriers.
- D) All children are colour blind.

16. Justifying the use of animals to develop drugs for treating human diseases is a controversial topic. Look at the following list of statements from a debate on this topic and select 2 statements that could be used to support the debate for using animals in drug development research.

Number	Statement
1	Animals undergo stress when they are used in drug trials.
2	Development of a drug is not worth the cost of the injury to the animal.
3	The benefit of being able to treat a disease outweighs the cost to the animal.
4	The National Research Council of Canada is committed to high

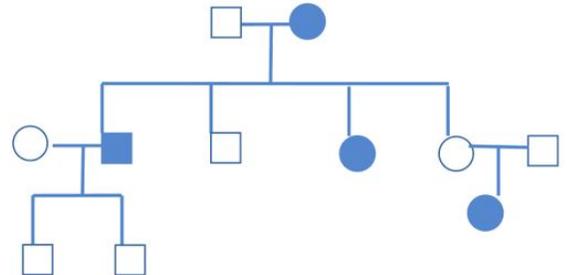
	ethical standards in animal research.
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Which statements support the debate "for" drug testing with animal?

- A) 2 and 3
- B) 1 and 4
- C) 3 and 4
- D) 2 and 4

17. The cells in the body that can engulf foreign invaders are
- A) macrophages
 - B) helper T-cells
 - C) killer T-cells
 - D) antibodies

18. The pedigree chart shown below depicts the inheritance pattern of sickle cell disease. Based on the pattern seen, what is the most likely mode of inheritance?



- A) X-linked recessive
- B) X-linked dominant
- C) Autosomal recessive
- D) Autosomal dominant

19. The blood in the veins of the extremities can flow against the force of gravity because
- A) the blood is pushed very hard by the heart
 - B) veins carry deoxygenated blood
 - C) veins turn into capillaries which help the blood flow
 - D) veins have one-way valves that prevent back-flow
20. The following data was reported by the Government of Canada regarding the number of West Nile virus human cases in Canada.

Year	Number of Cases/Year
2016	104
2015	80
2014	21
2013	115
2012	428

The incidence of West Nile virus:

- A) was calculated to be 1.04 for the year 2016.
- B) showed improvement in 2016 compared to 2015.
- C) measures how many people have a disease at any given moment.

D) refers to the number of new cases of disease within a specific time period.

21. A blood vessel is called a vein if it carries
- A) blood away from the heart
 - B) blood towards the heart
 - C) oxygenated blood
 - D) deoxygenated blood
22. Canadians are commonly infected with influenza viruses type A and B during the flu season. Which of the following is true regarding the cells involved in the resulting immune response?
- A) Phagocytes are a type of red blood cell.
 - B) Antibodies and macrophages perform phagocytosis.
 - C) B cells and T cells are formed and mature in the bone marrow.
 - D) Viruses bind to receptors on macrophages before phagocytosis.
23. Antibodies are important in the defence of the body. They
- A) are produced in response to antigens present in the blood
 - B) are produced by red blood cells in the blood
 - C) attack microphages in the blood
 - D) combine with antigens to make white blood cells
24. Refer to the following DNA Triplet Code and Amino Acid Table in order to

answer this question.

DNA Triplet Code	Amino Acid
TTC	Phenylalanine
TTT	Phenylalanine
TTA	Leucine
TTG	Leucine
CTT	Leucine
CTA	Leucine
ACA	Threonine
ACG	Threonine
TGT	Cysteine
TGC	Cysteine

Identify the DNA sequence that could produce the following amino acid chain.

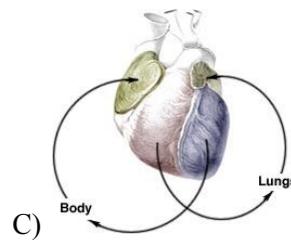
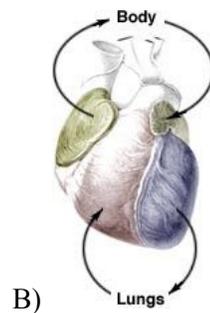
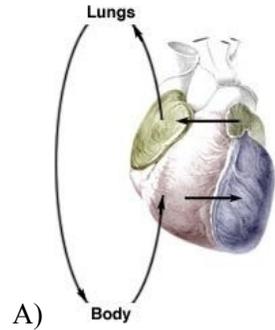
Leucine – Cysteine – Threonine

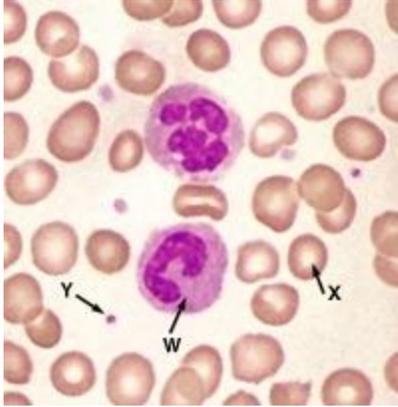
- A) CTTTGCTTC
- B) CTAACATGT
- C) TTATTCACA
- D) TTGTGTACA

25. If a person's resting blood pressure was 150/50, then the person would have
- A) lower-than-average systolic pressure and higher-than-average diastolic pressure
 - B) higher-than-average systolic pressure and lower-than-average diastolic pressure
 - C) lower-than-average systolic and diastolic pressure
 - D) higher-than-average systolic and diastolic pressure
26. When blood flows from the lungs to the heart, to the body and back to the heart, the chambers the blood flows through, in order, are
- A) right atrium, right ventricle, left atrium
 - B) left atrium, right ventricle, right atrium
 - C) right atrium, left ventricle, right atrium
 - D) left atrium, left ventricle, right atrium
27. The cells in the body that can turn off the immune response are:
- A) B-cells.

- B) helper T-cells.
- C) killer T-cells.
- D) suppressor T-cells.

28. Which of the following diagrams represents the correct flow of blood into and out of the heart?





29. The three types of cells labelled W, X, and Y above are, respectively,
- A) killer T-cells, nerve cells, and platelets
 - B) skin cells, red blood cells, and nerve cells
 - C) white blood cells, red blood cells, and platelets
 - D) stomach cells, red blood cells, and nerve cells
30. The component in blood that is responsible for clotting is
- A) red blood cells
 - B) white blood cells
 - C) platelets
 - D) plasma
31. You are designing a research study that evaluates the effect of the respiratory syncytial virus (RSV) on the immune response in humans. Which of the following statements is true regarding the immune response to the virus?
- A) The virus is the antigen that causes the immune response.
 - B) Inflammation resulting from the virus is a specific immune response.
 - C) Mucous present in the respiratory tract is an example of acquired immunity.
 - D) The innate immune response responds specifically to the type of virus

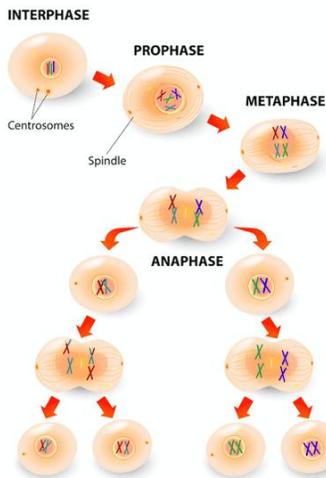
it detects.

32. When scientists add genes to a plant so that they resist pest attacks, this is an example of
- A) a mutation
 - B) gene removal
 - C) chromosomal anomaly
 - D) genetic engineering
33. An experimental drug has been developed to treat a bacterial infection, and the researchers need to design a study to test the effectiveness of this drug. Which of the following would be true regarding the use of a placebo in a double-blind study format?
- A) The purpose of using a double-blind study is to eliminate bias.
 - B) The placebo is a drug that is different from the experimental drug.
 - C) The researchers are aware which subjects have been given the drug.
 - D) The subjects must be advised if they are taking the drug or the placebo.
34. Cardiovascular exercise is considered to be beneficial for the heart. Which of the following is correct regarding exercise and the heart?
- A) Playing tennis will reduce your heart rate.
 - B) Sitting in a hot tub will increase your heart rate.
 - C) Professional athletes generally have higher resting heart rates.
 - D) Regular exercise will reduce the elasticity of the heart muscles.

35. Which of the following would be considered one of the body's first lines of defence against infection?

- A) B-cells
- B) Red blood cells
- C) Platelets
- D) Stomach acid

36. Use the following diagram to answer the question.



Which of the following statements is correct regarding the cell division diagram?

- A) Somatic cells are formed.
 - B) Diploid cells are produced.
 - C) The process shown is meiosis.
 - D) Final cells contain 46 chromosomes.
37. If a person's resting blood pressure was 140/95, then the person would have
- A) lower-than-average systolic pressure and higher-than-average diastolic pressure
 - B) higher-than-average systolic pressure and lower-than-average diastolic pressure
 - C) lower-than-average systolic and diastolic pressures
 - D) higher-than-average systolic and

diastolic pressures

38. The recessive blue allele is designated with "b" and the dominant brown allele is designated with "B". Which of the following statements is correct if you cross heterozygous brown eyes (Bb) with blue eyes (bb)?

- A) 25% of the offspring will have blue eyes
- B) 50% of the offspring will be homozygous
- C) 25% of the offspring will be heterozygous
- D) 75% of the offspring will have brown eyes

39. A greenhouse cross-pollinated two red-flowering geraniums. Out of the 1000 seedlings that were produced, 730 were red, while 270 were yellow. Which of the following Punnett squares could be used to explain these results?

A)

	R	r
R	RR	Rr
r	Rr	rr

B)

	r	r
R	Rr	Rr
r	rr	rr

C)

	R	R
R	RR	RR
r	Rr	Rr

D)

	R	R
R	Rr	Rr
r	Rr	Rr

40. You accidentally cut your finger with a knife in the kitchen. Which of the following blood components plays a key role in healing the cut?
- A) Plasma
 - B) Platelets
 - C) Red blood cells
 - D) White blood cells
41. Resting heart rates were determined for 4 different subjects in a research project. The subjects include a 20 year-old professional athlete, a 40 year-old healthy female, a 30 year-old healthy male, and a 70 year-old male with atherosclerosis.

Subject #1	Resting heart rate = 72 beats per minute
Subject #2	Resting heart rate = 40 beats per minute
Subject #3	Resting heart rate = 90 beats per minute
Subject #4	Resting heart rate = 65 beats per minute

What is the approximate number of heart beats per year for the subject with atherosclerosis? Explanation: Subject #3 is most likely to have atherosclerosis due to the elevated heart rate.

Calculation: $90 \text{ beats/min} \times 60 \text{ min/hour} \times 24 \text{ hours/day} \times 365 \text{ days/year}$

- A) 21 million
- B) 34 million

- C) 38 million
 - D) 47 million
42. If a person's resting blood pressure was 100/60, then the person would have
- A) lower-than-average systolic pressure and higher-than-average diastolic pressure
 - B) higher-than-average systolic pressure and lower-than-average diastolic pressure
 - C) lower-than-average systolic and diastolic pressures
 - D) higher-than-average systolic and diastolic pressures
43. Which of the following statements is true regarding antibiotic resistance?
- A) Overprescribing antibiotics contributes to antibiotic resistance.
 - B) Antibiotic resistance is a concern primarily in developed countries.
 - C) Antibiotic resistance can be resolved with the development of new drugs.
 - D) Antibiotics use on farms where animals are grown for food does not impact antibiotic resistance.
44. When an invader is detected within the body it is initially attacked by
- A) macrophages
 - B) helper T-cells
 - C) killer T-cells
 - D) antibodies

45. When blood flows from the lungs to the heart, to the body and back to the heart, the chambers the blood flows through, in order, are
- A) right atrium, right ventricle, left atrium
 - B) left atrium, right ventricle, right atrium
 - C) right atrium, left ventricle, right atrium
 - D) left atrium, left ventricle, right atrium
46. When injected with a flu shot (containing dead flu virus), in what order do these cells act to prepare the body for a subsequent infection of the flu?
- A) macrophages, killer-T cells, B-cells
 - B) macrophages, B-cells, helper-T cells
 - C) B-cells, macrophages, helper-T cells
 - D) macrophages, helper-T cells, B-cells
47. Which of the following is a correct statement with respect to DNA?
- A) DNA is composed of nucleotides.
 - B) Guanine can only bond to adenine.
 - C) The DNA molecule is a single helix shape.
 - D) Deoxyribose is the protein component of DNA.
48. This pedigree chart depicts the X-linked recessive inheritance pattern of colour blindness. The father is colour blind and the mother is not a carrier of the colour-blind trait. Which of the following statements is correct regarding the interpretation of the children in the pedigree chart?
- A) All children are carriers.
 - B) Both sons are colour blind.
 - C) Both daughters are carriers.
 - D) All children are colour blind.
49. Which of the following statements is true regarding the development of a human immunodeficiency virus (HIV) vaccine?
- A) There is no longer a need for a vaccine due to successful antiretroviral therapy (ART).
 - B) Some people are naturally immune to HIV so this makes developing a vaccine more challenging.
 - C) It is difficult to develop a vaccine since human immunodeficiency virus (HIV) mutates frequently.
 - D) Vaccine development is not needed since human immunodeficiency virus (HIV) is no longer a global public health issue.
50. When blood flows from the body to the heart, to the lungs and back to the heart, the chambers the blood flows through, in order, are
- A) right atrium, right ventricle, left atrium
 - B) left atrium, left ventricle, right atrium
 - C) left atrium, right ventricle, right atrium
 - D) right atrium, left ventricle, left atrium
51. A blood vessel is called an artery if it carries
- A) blood away from the heart
 - B) blood towards the heart
 - C) oxygenated blood
 - D) deoxygenated blood
52. When the structure of a gene changes, this is called a:
- A) haploid.
 - B) disjunction.
 - C) free radical.
 - D) mutation.

53. Refer to the following list of chromosome characteristics to answer the question.

1. Forms gametes
2. Outcome is 4 cells
3. Results in body cells
4. Undergoes 2 cell divisions
5. Daughter cells are identical

Which of the chromosome characteristics listed above apply to MEIOSIS?

- A) 1,3,5
B) 2,3,4
C) 1,2,4
D) 2,4,5
54. The process that occurs to produce sex cells such as sperm and egg cells is
A) mitosis
B) meiosis
C) fertilization
D) zygote
55. Synthetic insulin is used by many people with diabetes. The insulin producing gene is spliced into a plasmid that is inserted into bacteria. As the bacteria reproduce, insulin is produced. This process of insulin production is _____.
A) unethical.
B) called transgenics.
C) an example of gene therapy.

D) an example of bioweapon production.

56. An experimental drug has been developed to treat a bacterial infection, and the researchers need to design a study to test the effectiveness of this drug. Which of the following would be true regarding the use of a placebo in a double-blind study format?
A) The purpose of using a double-blind study is to eliminate bias.
B) The placebo is a drug that is different from the experimental drug.
C) The researchers are aware which subjects have been given the drug.
D) The subjects must be advised if they are taking the drug or the placebo.
57. If bacteria in an infection replicate out of control, this could be a result of
A) a low number of platelets
B) a low number of red blood cells
C) a low number of antigens
D) a low number of white blood cells
58. Sickle cell anemia is a blood disorder associated with abnormal hemoglobin. Which blood cells are directly affected by this disorder?
A) Platelets
B) Red blood cells
C) White blood cells
D) Red and white blood cells

59. Resting heart rates were determined for 4 different subjects in a research project. The subjects include a 20 year-old professional athlete, a 40 year-old healthy female, a 30 year-old healthy male, and a 70 year-old male with atherosclerosis.

Subject #1	Resting heart rate = 72 beats per minute
Subject #2	Resting heart rate = 40 beats per minute
Subject #3	Resting heart rate = 90 beats per minute
Subject #4	Resting heart rate = 65 beats per minute

What is the approximate number of heart beats per year for the subject with atherosclerosis? Explanation: Subject #3 is most likely to have atherosclerosis due to the elevated heart rate.

Calculation: $90 \text{ beats/min} \times 60 \text{ min/hour} \times 24 \text{ hours/day} \times 365 \text{ days/year}$

- A) 21 million
- B) 34 million
- C) 38 million
- D) 47 million

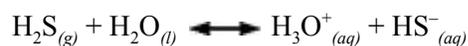
60. In the tissues of the body, the capillaries deliver

- A) nutrients and pick up oxygen
- B) nutrients and carbon dioxide

- C) oxygen and pick up nutrients
- D) oxygen and pick up wastes

Unit 2: Chemistry in the Environment

1.



The chemicals that are acting like Brønsted-Lowry acids are

- A) $\text{H}_2\text{S}_{(aq)}$ and $\text{HS}^-_{(aq)}$
 B) $\text{H}_2\text{S}_{(aq)}$ and $\text{H}_3\text{O}^+_{(aq)}$
 C) $\text{H}_3\text{O}^+_{(aq)}$ and $\text{HS}^-_{(aq)}$
 D) $\text{H}_2\text{O}_{(l)}$ and $\text{HS}^-_{(aq)}$
2. The following balanced equation shows a combustion reaction.
- $$2\text{C}_2\text{H}_2_{(g)} + 5\text{O}_2_{(g)} \longrightarrow 4\text{CO}_2_{(g)} + 2\text{H}_2\text{O}_{(l)}$$
- The chemical conversion that is occurring during this reaction is
- A) thermal to chemical energy.
 B) chemical to mechanical energy.
 C) chemical to thermal energy.
 D) chemical to electromagnetic energy.
3. Which of the following substances could be added to a lake with a pH of 5.20 to bring it back to a neutral state?
- A) sodium chloride
 B) hydrochloric acid
 C) calcium hydroxide
 D) oxygen

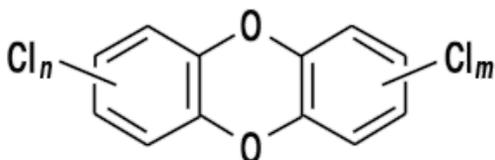
4. Which of the following substances would be called chloromethane?

- A) $\begin{array}{c} \text{H} \\ | \\ \text{H} - \text{C} - \text{H} \\ | \\ \text{Cl} \end{array}$
- B) $\begin{array}{c} \text{H} \quad \text{O} \\ | \quad || \\ \text{H} - \text{C} - \text{C} - \text{Cl} \\ | \quad | \\ \text{H} \quad \text{H} \end{array}$
- C) $\begin{array}{c} \text{H} \\ | \\ \text{H} - \text{C} - \text{Cl} \\ | \\ \text{F} \end{array}$
- D) $\begin{array}{c} \text{H} \quad \text{H} \\ | \quad | \\ \text{Cl} - \text{C} - \text{C} - \text{I} \\ | \quad | \\ \text{H} \quad \text{H} \end{array}$

5. One part of the metabolism of alcohol in the blood stream is to convert ethanol to ethanal. Which of the following chemicals represent ethanol and ethanal?
- A) $\text{CH}_3\text{COCH}_3_{(aq)}$ and $\text{CH}_3\text{COOH}_{(aq)}$
 B) $\text{CH}_3\text{COOH}_{(aq)}$ and $\text{C}_2\text{H}_5\text{OH}_{(aq)}$
 C) $\text{C}_2\text{H}_5\text{OH}_{(aq)}$ and $\text{CH}_3\text{CHO}_{(aq)}$
 D) $\text{CH}_3\text{CHO}_{(aq)}$ and $\text{CH}_3\text{COCH}_3_{(aq)}$
6. Acid spills from batteries can be safely neutralized by
- A) bleach
 B) ammonia
 C) baking powder
 D) baking soda
7. The pH of a sample of water is 1.44. The hydronium ion concentration $[\text{H}_3\text{O}^+_{(aq)}]$ of the sample (to the nearest hundredth) is _____ $\times 10^{-2}$ mol/L.
8. An indicator that could show a pH change from 4.00 to 6.00 would be
- A) bromothymol blue
 B) phenolphthalein
 C) methyl red
 D) orange IV

9.

The molecule shown below is a super toxin in our environment that is formed as a by-product of the manufacture, molding, or burning of organic chemicals and plastics.

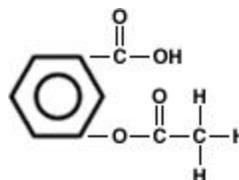


This molecule is an example of a:

- A) polyester
 - B) halogenated hydrocarbon
 - C) dioxin
 - D) chlorofluorocarbon
10. Which compound is an example of an alcohol?
- A) $\text{CH}_3\text{CH}_2\text{COOH}$
 - B) CH_3OH
 - C) $\text{CH}_2=\text{CHCH}_3$
 - D) $\text{CH}_3\text{-O-CH}_3$
11. A strong acid with a pH of 1.00 is
- A) $3\times$ more concentrated than an acid of pH 4.00
 - B) $3\times$ less concentrated than an acid of pH 4.00
 - C) $1000\times$ more concentrated than an acid of pH 4.00
 - D) $1000\times$ less concentrated than an acid of pH 4.00
12. The pH of blood is held consistently around 7.4 by a buffer system. The main

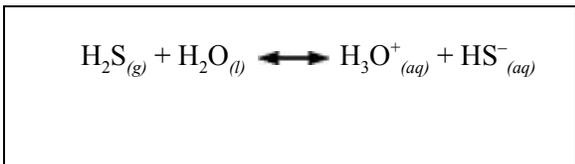
buffer system in the our blood system is called

- A) carbonic acid-bicarbonate
 - B) sulphate-bisulfate
 - C) nitrate-nitrite
 - D) hydronium-hydroxide
13. A 5.00 mL sample of a monoprotic base is diluted to 20.0 mL with distilled water. This sample is titrated to the end point with 15.38 mL of 0.25 mol/L HCl. What is the concentration of the base?
- A) 0.19 mol/L
 - B) 0.77 mol/L
 - C) 1.37 mol/L
 - D) 0.0769 mol/L



14. The functional groups present in the above structural formula are
- A) ether and an alcohol
 - B) carboxylic acid and an ester
 - C) ester and an alcohol
 - D) aldehyde and a ketone
15. Agricultural practices can contribute to water pollution through
- A) belching of methane from cattle
 - B) leakage of halogenated hydrocarbons
 - C) run off of nitrate (NO_3^-) and phosphate (PO_4^{3-}) fertilizers
 - D) overuse of PCB's
16. 25.0 mL of 0.150 mol/L sodium hydroxide is added to a 30.0 mL acid sample. Assuming that the acid was monoprotic, the concentration of the acid (to the nearest hundredth) was _____ mol/L.

17.



The chemicals that are acting like Brønsted-Lowry acids are

- A) $\text{H}_2\text{S}_{(aq)}$ and $\text{HS}^-_{(aq)}$
 B) $\text{H}_2\text{S}_{(aq)}$ and $\text{H}_3\text{O}^+_{(aq)}$
 C) $\text{H}_3\text{O}^+_{(aq)}$ and $\text{HS}^-_{(aq)}$
 D) $\text{H}_2\text{O}_{(l)}$ and $\text{HS}^-_{(aq)}$
18. The concentration of hydrogen ion (H^+) in 100 mL of solution having a $\text{pH} = 2.0$ is
- A) 1×10^{-1} mol/L
 B) 1×10^{-3} mol/L
 C) 5×10^{-2} mol/L
 D) 1×10^{-2} mol/L
19. Chlorofluorocarbons (CFCs) are harmful to the environment because they
- A) deplete the ozone layer
 B) cause respiratory disease
 C) cause acid deposition
 D) decrease the pH of rain water
20. Which of the following substances could be added to a lake with a pH of 5.20 to bring it back to a neutral state?
- A) sodium chloride
 B) hydrochloric acid
 C) calcium hydroxide
 D) oxygen
21. Because methanoic acid is a weak acid, when mixed with water, its properties include a
- A) a pH of less than 7 and a low degree of dissociation in water
 B) a pH of less than 7 and a high degree

of dissociation in water

C) a pH higher than 7 and a low degree of dissociation in water

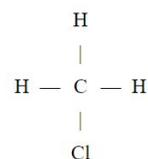
D) a pH higher than 7 and a high degree of dissociation in water

22. 0.74 g of HNO_3 is in 400 mL of solution. What is the pH of this solution?

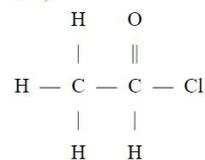
A) 0.12
 B) 1.93
 C) 1.53
 D) 0.029

23. Which of the following substances would be called chloromethane?

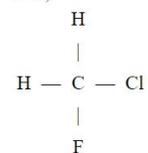
○A)



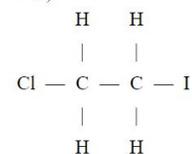
○B)



○C)



○D)

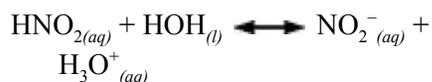


24. Which compound is an example of an alcohol?

A) $\text{CH}_3\text{CH}_2\text{COOH}$
 B) CH_3OH
 C) $\text{CH}_2=\text{CHCH}_3$
 D) $\text{CH}_3\text{-O-CH}_3$

25. It is inadvisable for chlorinated organic compounds to enter aquatic ecosystems because they
- A) act as acids and kill the organisms in the water.
 - B) do not easily break down and biomagnify in the food chain.
 - C) break down in the water to more toxic substances.
 - D) react with oxygen, removing it from the water.

26.



The chemicals that are acting like Brønsted-Lowry acids are

- A) $\text{HNO}_{2(aq)}$ and $\text{HOH}_{(l)}$
- B) $\text{HOH}_{(l)}$ and $\text{H}_3\text{O}^{+(aq)}$
- C) $\text{NO}_2^{-(aq)}$ and $\text{H}_3\text{O}^{+(aq)}$
- D) $\text{HNO}_{2(aq)}$ and $\text{H}_3\text{O}^{+(aq)}$

27.

A student is to determine the concentration of a 15.00 mL sample of NaOH solution by titration using a standard solution of 0.50 mol/L HCl. The following burette readings were recorded:

final reading = 40.68 mL

initial reading = 16.72 mL

What is the concentration of the NaOH solution?

- A) 0.95 mol/L
- B) 0.80 mol/L
- C) 1.4 mol/L
- D) 0.31 mol/L

28. A substance that contains both an acid and a base and which maintains the pH of a substance within a narrow range is called a(n)
- A) ester
 - B) neutralizer
 - C) acid-base pump
 - D) buffer
29. The concentration of hydrogen ion (H^+) in 100 mL of solution having a pH = 2.0 is
- A) 1×10^{-1} mol/L
 - B) 1×10^{-3} mol/L
 - C) 5×10^{-2} mol/L
 - D) 1×10^{-2} mol/L
30. A pesticide, to keep it from affecting the environment too greatly, should be
- A) a gas which easily evaporated into the air
 - B) a poison that can kill large groups of pests
 - C) a specific poison, only attacking one type of pest
 - D) very stable so that it can kill pests over a long period of time

Unit 3: Electromagnetic Energy

1.

Two resistors of 3.0Ω and 8.0Ω are connected in series across a 9.0 V battery.

What is the voltage drop across the 3.0Ω resistor?

- A) 9.0 V
 B) 6.5 V
 C) 7.4 V
 D) 2.5 V
2. The frequency of a light wave with a wavelength of $8.70 \times 10^{-7} \text{ m}$ is _____ $\times 10^{14} \text{ Hz}$ (to the nearest hundredth).
3. Your calculator may require 0.15 mA to function properly. If it takes you 1.5 min of working with your calculator to determine an answer, how many electrons must have flowed from the calculator battery while you were working?
 A) $1.4 \times 10^{15} \text{ e}^-$
 B) $8.4 \times 10^{19} \text{ e}^-$
 C) $8.4 \times 10^{16} \text{ e}^-$
 D) $1.4 \times 10^{18} \text{ e}^-$
4. A step down transformer changes
 A) electrical energy into mechanical energy
 B) mechanical energy into electrical

energy

C) low voltage DC to high voltage DC

D) high voltage AC to low voltage AC

5. Compared with visible light, ultraviolet radiation has a
 A) lower frequency and a longer wavelength
 B) lower frequency and a shorter wavelength
 C) higher frequency and a longer wavelength
 D) higher frequency and a shorter wavelength
6. A high-intensity halogen desk lamp operates at 1.50 A and 12.0 V AC . If it has a built-in transformer to step down the 120 V AC obtained from the wall outlet, then the current from the wall outlet is
 A) 0.100 A
 B) $4.63 \times 10^{-4} \text{ A}$
 C) 1.50 A
 D) 0.150 A
7. Radiation with a wavelength of $4.20 \times 10^{-9} \text{ m}$ has a frequency of _____ $\times 10^{16} \text{ Hz}$ (to the nearest hundredth).
8. Electrical energy is transmitted from a power generating station using
 A) DC to reduce transmission losses
 B) AC to prevent dangerous voltages
 C) AC to avoid radio interference
 D) DC to allow for increased power output
9. The equivalent resistance of a parallel circuit is always _____ the resistance of any resistor in the circuit.
 A) greater than
 B) less than
 C) equal to
 D) independent of

10. Electrical power in Europe is generated at a frequency of 50.0 Hz. The wavelength of electromagnetic radiation emitted from a power line (to the nearest hundredth) would be _____ $\times 10^6$ m.
11. 24.0 V from a solar panel is converted from DC to AC and then transformed to 480 V. If the transformer's secondary coil has 2500 turns of wire, the primary coil has _____ turns.
12. When white light from a lamp passes through a cool gas and then into a spectroscope, a/an _____ spectrum is produced.
- A) emission
B) absorption
C) inverted
D) continuous
13. A satellite is 7.20×10^6 m from Earth's centre. At this position, the gravitational field strength of Earth on the satellite (to the nearest hundredth) is _____ N/kg.
14. Household circuits are wired in
- A) series to decrease resistance
B) parallel to increase resistance
C) series so that the amount of current to each appliance varies
D) parallel so that the current for each appliance is enough
15. What voltage is applied to a 6.80Ω resistor if the current is 3.20 A?
- A) 2.1 V
B) 0.50 V
C) 22 V
D) 70 V
16. Your calculator may require 0.15 mA to function properly. If it takes you 1.5 min of working with your calculator to determine an answer, how many electrons must have flowed from the calculator battery while you were working?
- A) $1.4 \times 10^{15} e^-$
B) $8.4 \times 10^{19} e^-$
C) $8.4 \times 10^{16} e^-$
D) $1.4 \times 10^{18} e^-$
17. If the voltage and current to an appliance are 115 V and 12.0 A respectively, then the power used by the appliance is
- A) 1.38 kW
B) 9.58 kW
C) 0.104 kW
D) 1.25 kW
18. A circuit consists of a 35Ω resistor, a 55Ω resistor, and a 100Ω resistor arranged in series and connected to a 266 V power supply. What would the reading of a voltmeter that is connected across the smallest resistor be?
- A) 528 V
B) 49 V
C) 25 V
D) 2.3 V
19. When light passes through a lens, it bends. The bending of light in this fashion is called
- A) reflection
B) refraction
C) interference
D) diffraction
20. Electrical energy is transmitted from a power generating station using
- A) DC to reduce transmission losses
B) AC to prevent dangerous voltages
C) AC to avoid radio interference
D) DC to allow for increased power output

21.

Electromagnetic Radiation (EMR) Terms	
1	Total internal reflection
2	Doppler effect
3	Absorption spectrum
4	Microwave

Match the EMR terms with their uses. Use each number only once.

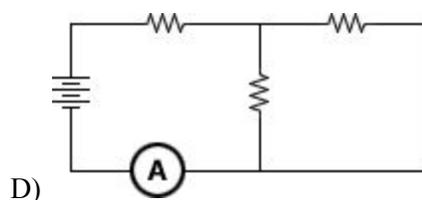
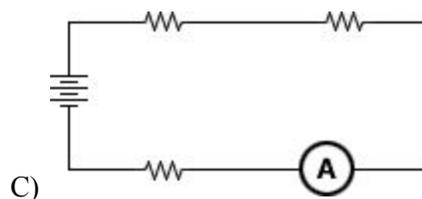
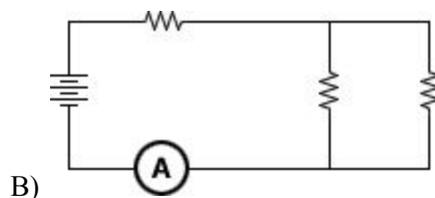
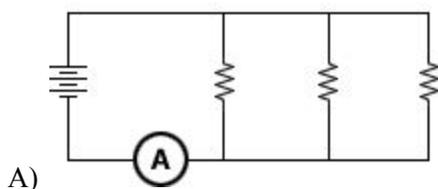
- Motion of stars _____
 Fibre optic cables _____
 Composition of stars _____
 Telecommunications _____

Write your answer as four digits separated by commas

22. Electrical power in North America is generated at a frequency of 60.0 Hz. The wavelength of electromagnetic radiation emitted from a power line (to the nearest hundredth) would be _____ $\times 10^6$ m.

23. As two charged objects separate, the field strength between them
- A) decreases by the square of the distance that separates them.
 - B) increases by the square of the distance that separates them.
 - C) decreases by the distance that separates them.
 - D) increases by the distance that separates them.

24. Which of the following circuits would result in the ammeter with the lowest reading, if all voltage sources and resistances are equal?



25. A 15.0Ω bell and an 8.0Ω lamp are connected in parallel and placed across a potential difference of 42 V.

What is the equivalent resistance of the circuit?

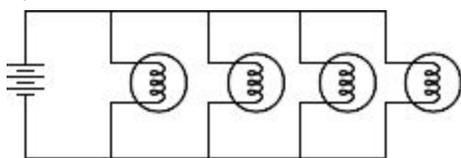
- A) 23.0Ω
- B) 0.19Ω
- C) 5.2Ω
- D) 7.0Ω

Flame Colour	
1	bright white
2	dark blue
3	bright red
4	yellow

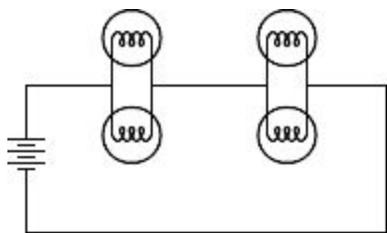
26. List the flames in order from the hottest burning temperature to the coldest burning temperature. Separate the numbers by commas.

27. The arrangement of bulbs that will produce the brightest light is

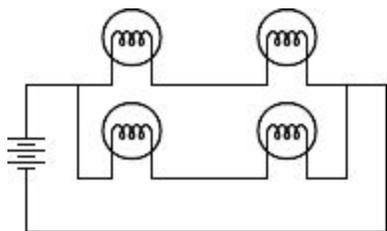
A)



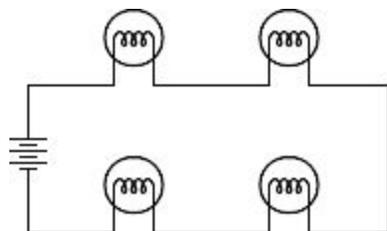
B)



C)



D)



28.

Two resistors of 3.0Ω and 8.0Ω are connected in series across a 9.0 V battery.

What is the equivalent resistance of the circuit?

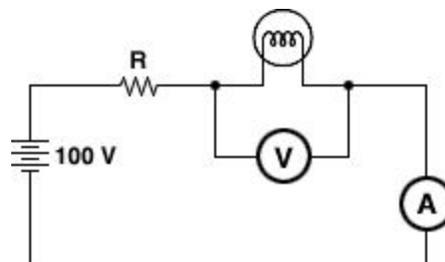
A) 11.0Ω

B) 5.0Ω

C) 0.46Ω

D) 2.2Ω

29.



In the circuit above, the voltmeter reads 80 V and the ammeter reads 1.0 A . The value of the resistor, R , will be

A) 30Ω

B) 20Ω

C) 120Ω

D) 53Ω

30. The rise and fall of tides around the world is mostly caused by the

A) gravitational fields of the sun and moon

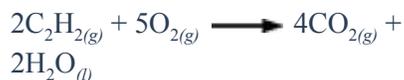
B) revolution of the Earth around the Sun

C) rotation of the Earth on its axis

D) Both A and C are correct

Unit 4: Energy and the Environment

1. The following balanced equation shows a combustion reaction.



The chemical conversion that is occurring during this reaction is

- A) thermal to chemical energy.
 B) chemical to mechanical energy.
 C) chemical to thermal energy.
 D) chemical to electromagnetic energy.
2. Spent fuel is used to describe
- A) the residue from a coal-fired plant.
 B) the smog produced by a gasoline engine
 C) the radioactive waste from a nuclear reactor
 D) the money paid for gasoline
3. Which of the following energy producers loses a lot of thermal energy during production?
- A) coal
 B) hydro
 C) solar
 D) wind
4. The molar enthalpy of combustion for sucrose, assuming gaseous products, to the nearest hundredth, is $-\text{_____} \times 10^3$ kJ/mol.
- 5.



$$H_{\text{fNO}_2} = 33.2 \text{ kJ/mol}$$

The energy released by the combustion of ammonia, as shown above, to the nearest hundredth, is $-\text{_____} \times 10^2$ kJ.

6. The molar enthalpy of combustion for ethane, assuming gaseous products, to the nearest hundredth, is $-\text{_____} \times 10^3$ kJ/mol.
7. Which of the following is the main cause of tides on the Earth?
- A) the fast rotation of the Earth
 B) the core of the Earth in combination with Earth's magnetic field
 C) the gravitational forces from the Moon and the Sun
 D) the heating of the oceans by the Sun
8. Compared to coal-fired power plants, a nuclear plant will produce more
- A) ash
 B) greenhouse gases
 C) energy per gram of fuel
 D) kilograms of waste

9.

Forms of Energy Conversion

1: chemical \longrightarrow mechanical

2: mechanical \longrightarrow electrical

3: chemical \longrightarrow electrical

4: electrical \longrightarrow electromagnetic

Which of the above is apparent in a diesel generator?

Write your numerical response in the blank provided.

10. Sulfur dioxide gas contributes to
- acid deposition
 - global warming
 - ozone depletion
 - biomagnification
11. On a shore-line, which of the following would most likely have the largest concentrations of heavy metals?
- algae
 - mosquitos
 - fish
 - dolphins

12. Over time, the break down of the ozone layer causes more

- transmission of radio signals
- global warming
- mutations
- CFCs

13.

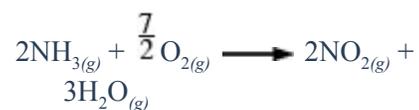


The heat of combustion of hydrogen sulfide, as shown above, to the nearest hundredth, is $-\text{_____} \times 10^2$ kJ/mol.

14. Which of the following energy producers loses a lot of thermal energy during production?

- coal
- hydro
- solar
- wind

15.

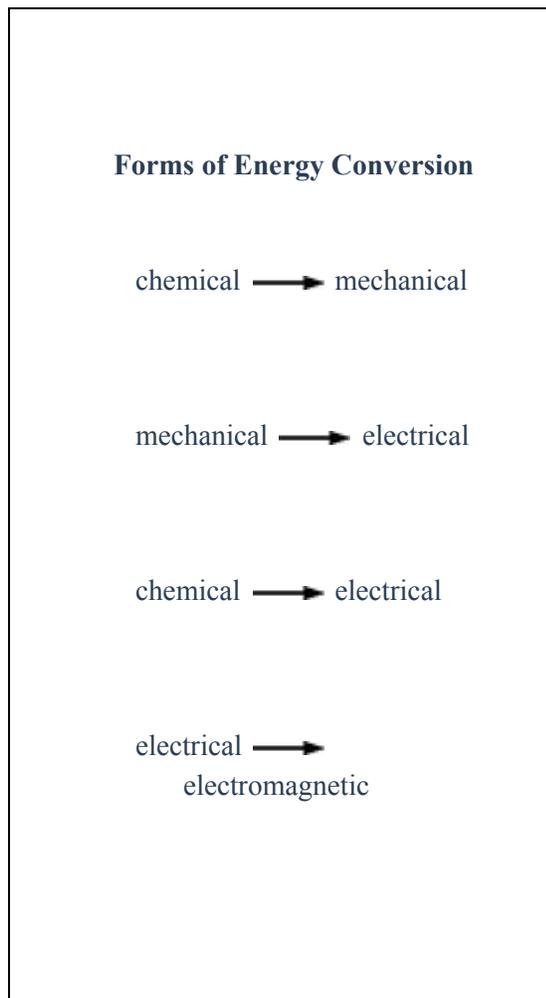


$$H_{\text{fNO}_2} = 33.2 \text{ kJ/mol}$$

The energy released by the combustion of ammonia, as shown above, to the nearest hundredth, is $-\text{_____} \times 10^2$ kJ.

16. When solar energy is used to heat liquids in underground tanks, the energy conversion is solar to
- electrical
 - chemical
 - hydro
 - thermal
17. The energy conversion that would happen inside photovoltaic cells in a calculator are
- electromagnetic to electrical
 - electric to electromagnetic
 - chemical to electrical
 - electromagnetic to chemical
18. The molar enthalpy of combustion for ethane, assuming gaseous products, to the nearest hundredth, is $-\text{_____} \times 10^3$ kJ/mol.
19. Fish-eating birds such as pelicans and sea-gulls have a higher amount of mercury in their tissues than the fish they eat. This is a result of
- biological transmission
 - biological selection
 - mutations
 - biomagnification
20. The molar enthalpy of combustion for propane, assuming gaseous products, to the nearest hundredth, is $-\text{_____} \times 10^3$ kJ/mol.
21. The molar enthalpy of combustion for pentane, assuming gaseous products, to the nearest hundredth, is $-\text{_____} \times 10^3$ kJ/mol.
22. $\text{C}_2\text{H}_5\text{OH}_{(l)} + 3\text{O}_{2(g)} \longrightarrow 2\text{CO}_{2(g)} + 3\text{H}_2\text{O}_{(g)}$
The heat of combustion of ethanol is
- 277.1 kJ/mol
 - 1512.4 kJ/mol
 - 1235.3 kJ/mol
 - 358.2 kJ/mol
23. Compared to coal-fired power plants, a nuclear plant will produce more
- ash
 - greenhouse gases
 - energy per gram of fuel
 - kilograms of waste
24. Geothermal energy is being developed as a practical source of heating for homes. Its main advantage is that
- it produces significant amounts of carbon dioxide
 - it requires a sunny location to operate efficiently
 - it can generate heat with very few mechanical parts year-round
 - it produces significant amounts of radioactive wastes
25. Algae blooms significantly change the oxygen content in lakes and rivers when they occur. Which of the following would cause algae to grow out of control?
- pesticides
 - CFCs
 - ozone
 - phosphates
26. Which of the following sources would cause an accumulation of dioxin pollution? A) automobiles
- paint
 - fertilizers
 - pesticides
27. One difference between nuclear reactions and chemical reactions is that in chemical reactions,
- mass is neither created nor destroyed
 - energy is neither created nor destroyed
 - the mass of the reactants is smaller than the mass of the products
 - the mass of the reactants is larger than the mass of the products

28.



Which of the above is apparent in a light bulb?

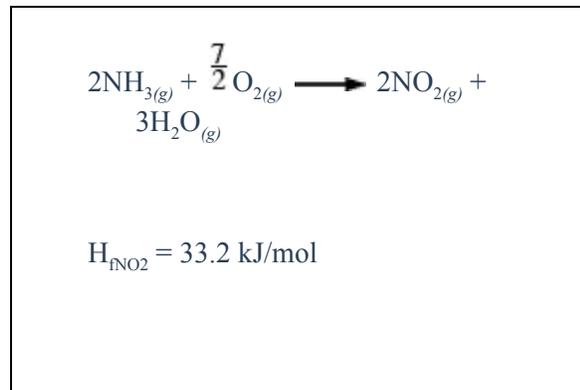
Write your numerical response in the blank provided.

29. The energy conversion that would happen inside photovoltaic cells in a calculator are
- electromagnetic to electrical
 - electric to electromagnetic
 - chemical to electrical
 - electromagnetic to chemical
30. An environmental concern that is associated with coal burning but not

with nuclear power plants is

- acid rain
 - radioactive waste
 - ozone loss
 - nuclear melt-downs
31. Which of the following industries could be responsible for an algae bloom?
- a farm
 - a coal-fired power plant
 - a pesticide plant
 - a smoke stack from a factory
32. $C_4H_{10(g)} + 6.5O_{2(g)} \longrightarrow 4CO_{2(g)} + 5H_2O_{(g)}$
The heat of combustion for butane (to the nearest hundredth) is $-____ \times 10^3$ kJ/mol.
33. The molar enthalpy of combustion for acetic acid, assuming gaseous products, to the nearest hundredth, is $-____ \times 10^2$ kJ/mol.
34. The heat of combustion for ethyne, assuming gaseous products, to the nearest hundredth, is $-____ \times 10^3$ kJ/mol.
35. The molar enthalpy of combustion for benzene, assuming gaseous products, to the nearest hundredth, is $-____ \times 10^3$ kJ/mol.
36. The molar enthalpy of combustion for ethane, assuming gaseous products, to the nearest hundredth, is $-____ \times 10^3$ kJ/mol.
37. A nuclear-powered aircraft carrier is most likely fueled by
- methanol
 - octane (gasoline)
 - kerosene
 - uranium

38.

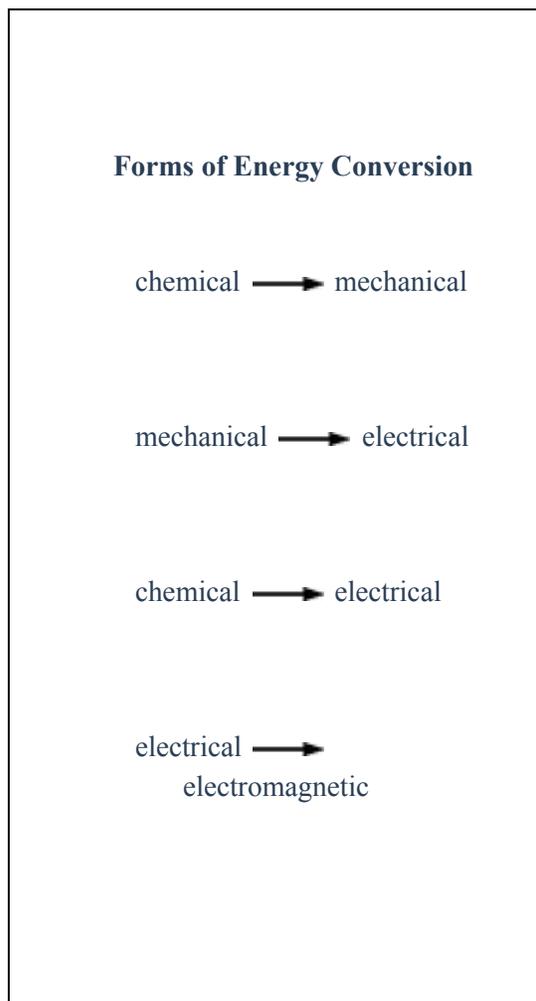


The energy released by the combustion of ammonia, as shown above, to the nearest hundredth, is $-\text{_____} \times 10^2 \text{ kJ}$.

39. Which of the following power plants could contribute to global warming?
- Natural gas powered
 - Tidal powered
 - Nuclear powered
 - Solar powered
40. Which of the following sources would cause an accumulation of heavy metal pollution?
- automobiles
 - paint
 - fertilizers
 - pesticides
41. The molar enthalpy of combustion for ethane, assuming gaseous products, to the nearest hundredth, is $-\text{_____} \times 10^3 \text{ kJ/mol}$.
42. Which of the following is the main cause of tides on the Earth?
- the fast rotation of the Earth
 - the core of the Earth in combination with Earth's magnetic field

- the gravitational forces from the Moon and the Sun
- the heating of the oceans by the Sun

43.

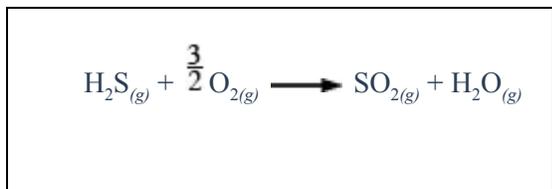


Which of the above is apparent in a light bulb?

Write your numerical response in the blank provided.

44. In a nuclear reaction, the mass of the products was determined to be less than the mass of the reactants. A correct explanation of this is that
- A) the reaction was a beta-decay
 - B) a large amount of energy was released in the reaction
 - C) the mass of the alpha and beta particles was not accounted for
 - D) a large amount of energy was required to cause the reaction to occur
45. Spent fuel is used to describe
- A) the residue from a coal-fired plant.
 - B) the smog produced by a gasoline engine
 - C) the radioactive waste from a nuclear reactor
 - D) the money paid for gasoline

46.



The heat of combustion of hydrogen sulfide, as shown above, to the nearest hundredth, is $-\text{_____} \times 10^2$ kJ/mol.

47. Over time, the break down of the ozone layer causes more
- A) transmission of radio signals
 - B) global warming
 - C) mutations
 - D) CFCs
48. The molar enthalpy of combustion for sucrose, assuming gaseous products, to the nearest hundredth, is $-\text{_____} \times 10^3$ kJ/mol.

49. Which of the following sources would cause an accumulation of heavy metal pollution?
- A) automobiles
 - B) paint
 - C) fertilizers
 - D) pesticides
50. Algae blooms significantly change the oxygen content in lakes and rivers when they occur. Which of the following would cause algae to grow out of control?
- A) pesticides
 - B) CFCs
 - C) ozone
 - D) phosphates

Answers

Unit 1: Living Systems in the Environment

1. B
2. C
3. A
4. A
5. B
6. A
7. C
8. C
9. A
10. B
11. D
12. C
13. C
14. A
15. C
16. C
17. A
18. C
19. D
20. D
21. B
22. D
23. A
24. D
25. B
26. D
27. D
28. C
29. C
30. C
31. A
32. D

33. A
34. B
35. D
36. C
37. D
38. B
39. A
40. B
41. D
42. C
43. A
44. A
45. D
46. D
47. A
48. C
49. C
50. A
51. A
52. D
53. C
54. B
55. B
56. A
57. D
58. B
59. D
60. D

Unit 2: Chemistry in the Environment

1. B
2. C
3. C
4. A
5. C

6. D
7. 3.63
8. C
9. C
10. B
11. C
12. A
13. B
14. B
15. C
16. 0.13
17. B
18. D
19. A
20. C
21. A
22. C
23. A
24. B
25. B
26. D
27. B
28. D
29. D
30. C

Unit 3: Electromagnetic Energy

1. D
2. 3.45
3. C
4. D
5. D
6. D
7. 7.14
8. A

9. B
10. 6.00
11. 125
12. B
13. 7.69
14. D
15. C
16. C
17. A
18. B
19. B
20. A
21. 2,1,3,4
22. 5.00
23. A
24. C
25. C
26. 1,2,4,3
27. A
28. A
29. B
30. C

Unit 4: Energy and the Environment

1. C
2. C
3. A
4. 5.16
5. 5.67
6. 1.43
7. C
8. C
9. 3
10. A
11. D
12. C
13. 5.18

- 14. A
- 15. 5.67
- 16. D
- 17. A
- 18. 1.43
- 19. D
- 20. 2.04
- 21. 3.27
- 22. C
- 23. C
- 24. C
- 25. D
- 26. D
- 27. A
- 28. A
- 29. A
- 30. A
- 31. A
- 32. 2.66
- 33. 7.86
- 34. 1.26
- 35. 3.14
- 36. 1.43
- 37. D
- 38. 5.67
- 39. A
- 40. B
- 41. 1.43
- 42. C
- 43. A
- 44. B
- 45. C
- 46. 5.18
- 47. C
- 48. 5.16
- 49. B
- 50. D