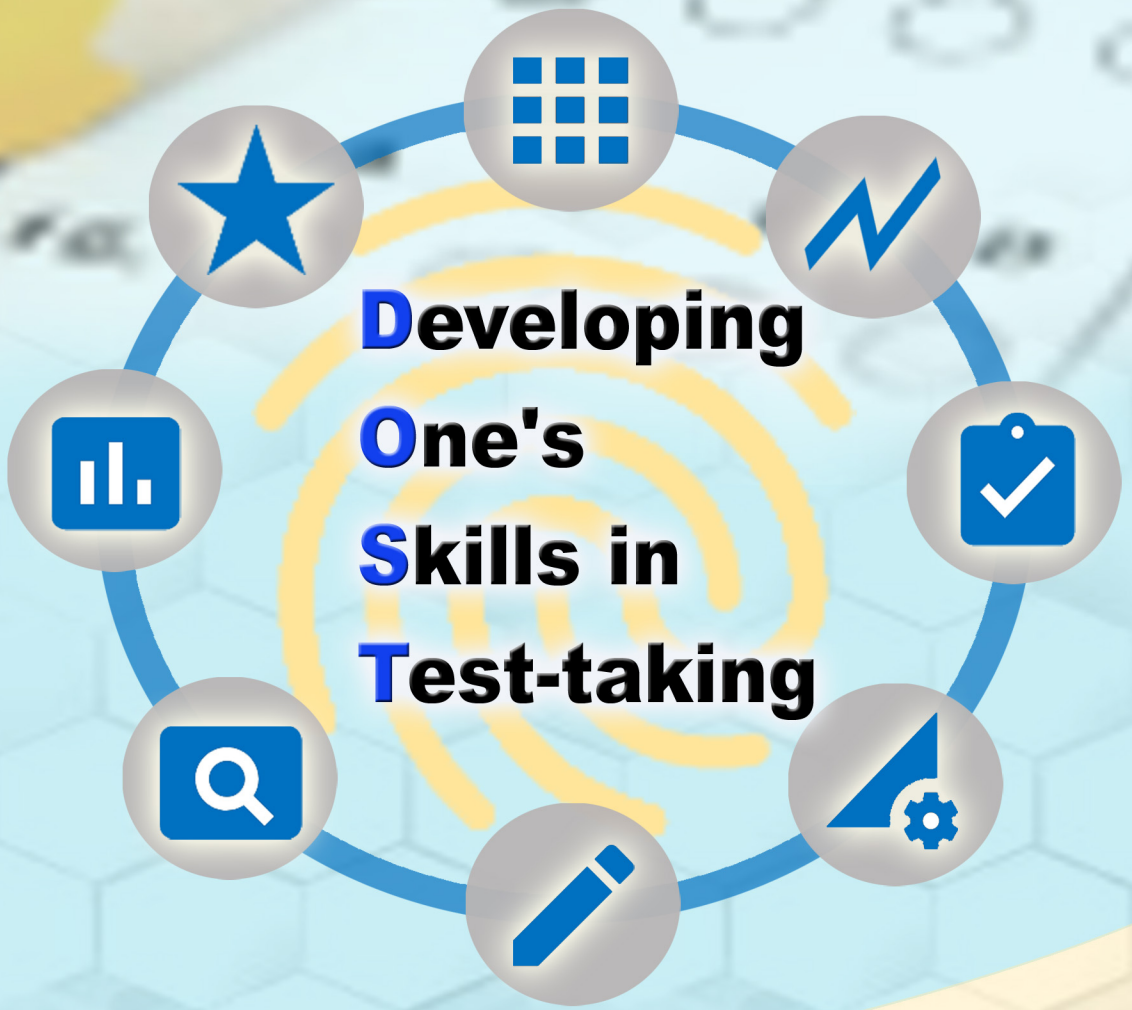
Enrichment Program for Municipalities Without Qualifiers in the DOST-SEI Undergraduate Scholarship Examination

SIYENSYA-bilidad 2



Department of Science and Technology
SCIENCE EDUCATION INSTITUTE

SIYENSYA-bilidad 2

(D*eveloping* ***O****ne's* ***S****kills in* ***T****est-taking)*

Enrichment Program for Municipalities Without Qualifiers in the DOST-SEI Undergraduate Scholarship Examination

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FOREWORD

In our continuing effort to increase the number of qualifiers to the Department of Science and Technology-Science Education Institute (DOST-SEI) Undergraduate Scholarship Examination, we are pleased to provide you with SIYENSYA-bilidad 2. This is a review material designed to familiarize students with the type of test included in the DOST-SEI Undergraduate Scholarship Examination.

SIYENSYA-bilidad 2 signifies our commitment to help the promising graduating senior high school students qualify to the DOST-SEI Undergraduate Scholarship and eventually join the pool of science, technology, engineering, and mathematics professionals in the country.

Happy reviewing! Be a DOST-SEI Scholar!

Josette T. Biyo

JOSETTE T. BIYO, Ph.D.
Director

ABOUT THIS MATERIAL

This review material has two (2) parts: 1) Logical Reasoning; and 2) Power Test. Logical reasoning consists of two (2) sub-tests, as follows: 1) Verbal Reasoning; and 2) Non-Verbal Reasoning. Power Test, on the other hand, have four (4) sub-tests, namely: 1) English; 2) Science; 3) Mathematics; and 4) Mechanical Technical. The Science sub-test consists of the following subject areas: 1) Biology; 2) Chemistry; 3) Physics; and 4) Earth Science.

Verbal Reasoning tests your ability to understand, analyze and interpret information. It also measures your ability to extract meaning from complex information and to think logically and analytically. Non-Verbal Reasoning measures your abilities to: visualize and transform images in your mind; recreate visual experiences and reasoning about shape, measurement, depiction and navigation; and mentally rotate and manipulate two and three-dimensional spaces.

The English sub-test measures your ability to apply the rules of the English language, specifically on grammar and syntax, vocabulary and reading comprehension. Science sub-test consists of test items in Biology, Chemistry, Physics, and Earth Science that will test your ability to accomplish various important scientific tasks. Mathematics sub-test will measure your ability to comprehend qualitative relationships and their representations. Mechanical-Technical will measure your ability to acquire information about everyday physics and to comprehend mechanical relationships. It consists of mechanical and electrical problems, as well as items that deal with physical forces.

The answer key is given at the end for your reference. Some answers are provided with rationalization, or an explanation as to how the answers were arrived at, for your guidance.

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AUTHORS

I. CONSULTANT/RESOURCE PERSON

Filma G. Brawner, Ph.D. - Consultant
Former DOST-SEI Director

Marilyn U. Balagtas, Ph.D. – Resource Person
Dean, College of Flexible Learning and e-PNU
Philippine Normal University

II. DOMAIN EXPERTS/ITEM WRITERS

Non-Verbal Reasoning and Mechanical-Technical

Roan Mamba – Domain Expert/Item Writer
Technological University of the Philippines - Manila

Ramil Jimenez – Item Writer
Mapua Institute of Technology

Nestley Sore – Item Writer
Adamson University

Mark Angelo Purio – Item Writer
Adamson University

Verbal Reasoning and English

Benigno Montemayor, Jr. – Domain Expert/Item Writer
Philippine Science High School - Main Campus

Ma. Concepcion Raymundo – Item Writer
Philippine Normal University

Maria Teresa Manicio – Item Writer
Philippine Normal University

Biology

Lillian Jennifer Rodriguez, Ph.D. – Domain Expert/Item Writer
UP Institute of Biology – Diliman

Josephine Joy Tolentino – Item Writer
Philippine Science High School – Central Luzon Campus

AUTHORS

Chemistry

Lawrence John Paulo Trinidad – Domain Expert/Item Writer
UP Institute of Chemistry – Diliman

Mark Steven Santiago – Item Writer
UP Institute of Chemistry – Diliman

Brenda Pelagio – Item Writer
Philippine Science High School – Central Luzon Campus

Melody Clerigo – Item Writer
Philippine Normal University

Physics

Analiza De Leon – Domain Expert/Item Writer
Philippine Science High School – Central Luzon Campus

Mitchie Bern Beniga – Item Writer
Philippine Science High School – Central Luzon Campus

Von Anthony Torio – Item Writer
Philippine Normal University

Bernard Llaguno – Item Writer
Philippine Science High School - Main Campus

Earth Science

Rey Niño Baguio – Domain Expert/Item Writer
Philippine Science High School - Main Campus

Karizz Anne Morante – Item Writer
Philippine Science High School – Central Luzon Campus

Leo Armada, Ph.D. – Item Writer
UP National Institute of Geological Sciences – Diliman

Crisanta Ocampo – Item Writer
Philippine Normal University

Mathematics

Fortunato Tacuboy III – Domain Expert/Item Writer
Philippine Science High School - Main Campus

AUTHORS

Aldous Cesar Bueno – Item Writer
Philippine Science High School - Main Campus

Myla Detecio – Item Writer
Philippine Normal University

III. PROJECT MANAGEMENT STAFF

Josette T. Biyo, Ph.D.
Director, SEI

Ruby Caroliza D. Laña
Chief, SEID-SEI

Amparo F. Olarte
Supervising Science Research Specialist, SEID-SEI

Rodelio G. de Asis
Senior Science Research Specialist, SEID-SEI

Jobelle P. Gayas
Science Research Specialist II, SEID-SEI

SIYENSYA-bilidad 2

I. LOGICAL REASONING

VERBAL REASONING

Verbal Reasoning tests your ability to understand, analyze and interpret information. It also measures your ability to extract meaning from complex information and to think logically and analytically.

1. SARAH:TBSBT::PALMA:

   A. NBQJBO
   B. RIFJMBO
   C. QBMNB
   D. SBSSZ

2. BIG:ENORMOUS::SMALL:

   A. MINISCULE
   B. VOLUMINOUS
   C. MACROSCOPIC
   D. PARASITIC

3. GALILEO GALILEI:TELESCOPE::BENJAMIN FRANKLIN:

   A. ELECTRICITY
   B. STEAM ENGINE
   C. TELEGRAPH WIRE
   D. MOTION PICTURE CAMERA

4. ALBERT EINSTEIN:LAW OF GRAVITY:: ALEXANDER FLEMING:

   A. PENICILLIN
   B. MONOGRAPH
   C. TELEPHONE
   D. SONOGRAM

5. BAT:BALL::BOW:_____

   A. ARROW
   B. TIE
   C. STRING
   D. BONE

6. HIDE:CONCEAL::STOP:_____

   A. PAUSE
   B. REFLECT
   C. HALT
   D. PONDER

7. BOWED STRINGS:VIOLIN::WOODWIND:_____

A. GUITAR
B. FLUTE
C. PIANO
D. HORN

8. WHALE:POD::KITTEN:_____

A. PACK
B. HERD
C. LITTER
D. PRIDE

9. SPONGE:POROUS::SKUNK:_____

A. SHINY
B. CARNIVOROUS
C. NOCTURNAL
D. SMELLY

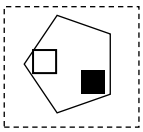
10. DO:DID::COST:_____

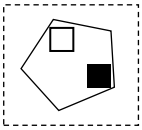
A. COSTED
B. COAST
C. COASTED
D. COST

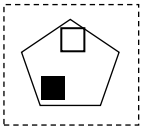
NON-VERBAL REASONING

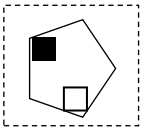
In this test you will be performing tasks that will measure your abilities to: visualize and transform images in your mind; recreate visual experiences and reasoning about shape, measurement, depiction and navigation; and mentally rotate and manipulate two and three-dimensional spaces.

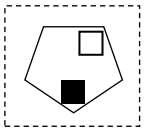
1. Which one is identical to this figure?



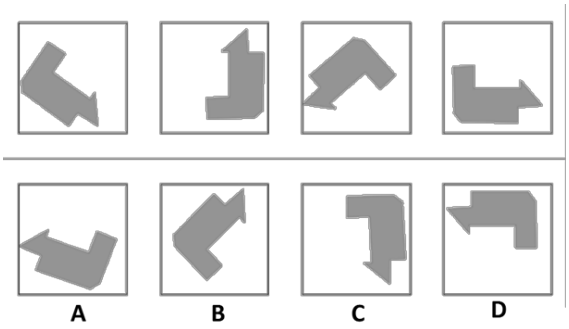
A. 

C. 

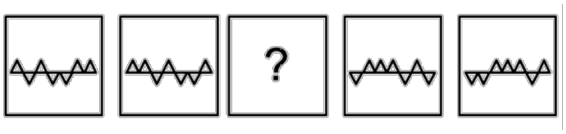
B. 

D. 

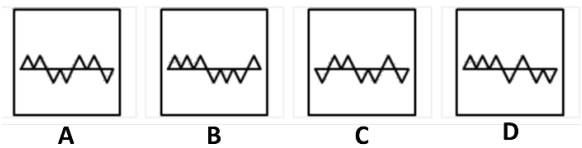
2. Which box contains the same shape as the top series?



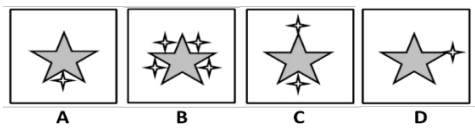
3. Which of the following frames completes the pattern?



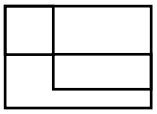
Options:

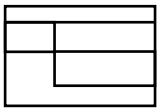


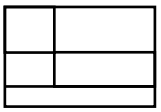
4. Which of the following frames does not belong to the group?

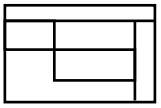


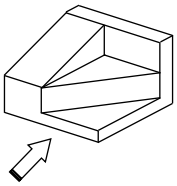
5. A three-dimensional object is shown. Which front side view is correct?

A. 

B. 

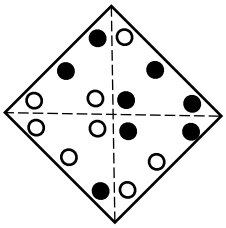
C. 

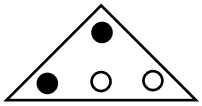
D. 

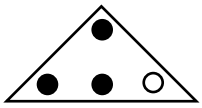


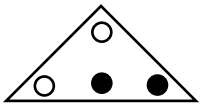
Front view

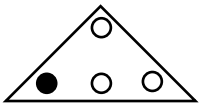
6. Which of the four figures below is the result when the figure is folded along the dotted lines?



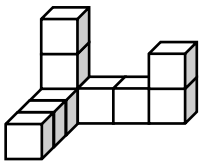
A. 

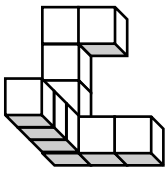
B. 

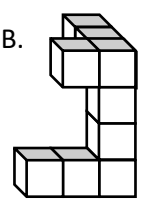
C. 

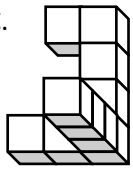
D. 

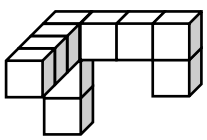
7. Which of the four choices below is the rotated version of the given figure?



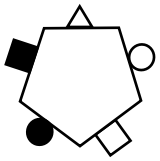
A. 

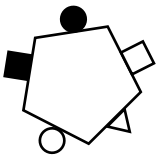
B. 

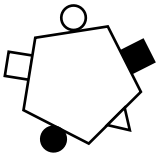
C. 

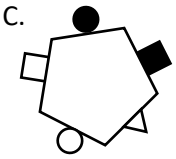
D. 

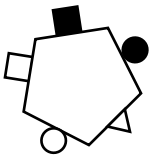
8. If you rotate the given figure, which of the following will be the result?



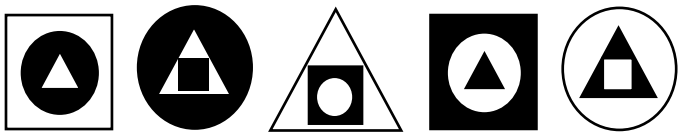
A. 

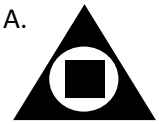
B. 

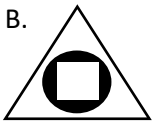
C. 

D. 

9. Which is the next figure in the series?



A. 

B. 

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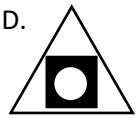
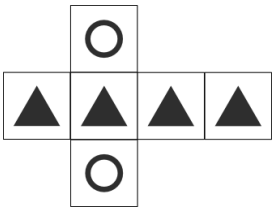
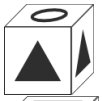
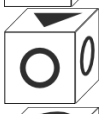
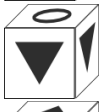
D. 

10. Which cube cannot be made based on the unfolded cube?



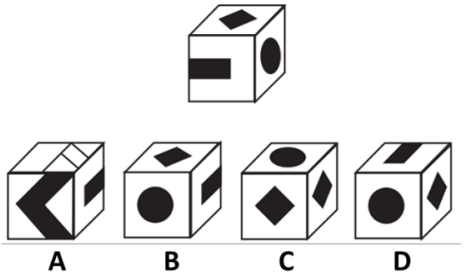
A. 

B. 

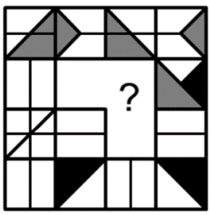
C. 

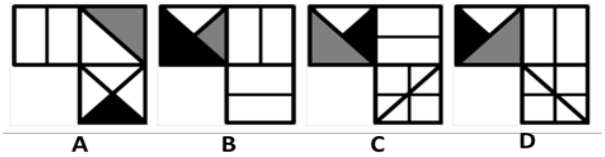
D. 

11. Which of the answer cubes is the original cube rotated in any direction?

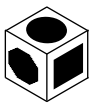


12. Which of the following frames completes the pattern?





13. Two pieces of the cube puzzle with three adjacent faces in each piece are shown and to be used to form a cube. Each face is drawn with figure different to other sides. Which view fits to the arrangement of the symbol when the cube is assembled?

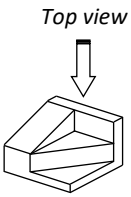
A. 

B. 

C. 

D. 

14. A three-dimensional object is shown. Which top side view is correct?



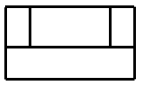
A. 

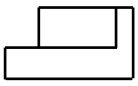
B. 

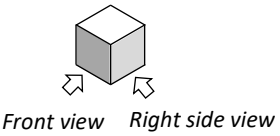
C. 

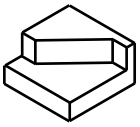
D. 

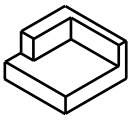
15. Create a three-dimensional object out of the two given views below.

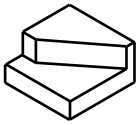


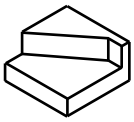




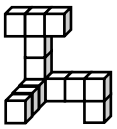
A. 

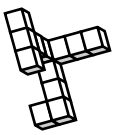
B. 

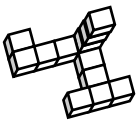
C. 

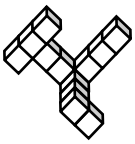
D. 

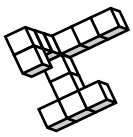
16. Which of the four choices below is the rotated version of the given figure?



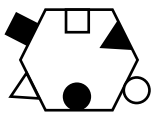
A. 

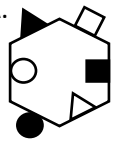
B. 

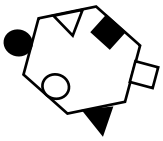
C. 

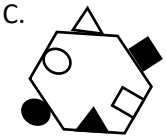
D. 

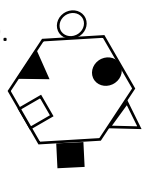
17. If you rotate the given figure, which of the following will be the result?



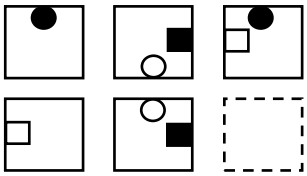
A. 

B. 

C. 

D. 

18. Which is the next figure in the series?



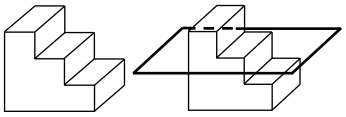
A. 

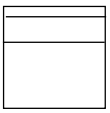
B. 

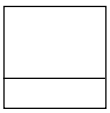
C. 

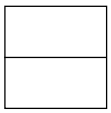
D. 

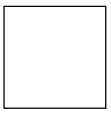
19. Which of the four choices is the result when the figure is cut by a plane as shown below?



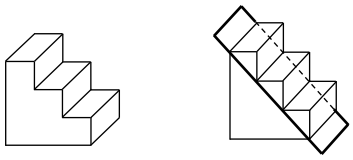
A. 

B. 

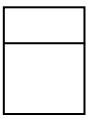
C. 

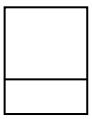
D. 

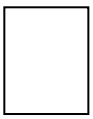
20. Which of the four choices is the result when the figure is cut by a plane as shown below?



A. 

B. 

C. 

D. 

II. POWER TEST

ENGLISH

This sub-test measures your ability to apply the rules of the English language, specifically on grammar and syntax, vocabulary and reading comprehension.

1. Roman got 85% in his Math exam in the last quarter and 87% this quarter. Which sentence best describes Roman's scores?

   A. Roman's Math scores had improved.
   B. Roman's Math scores have improved.
   C. Roman's Math scores will have improved.
   D. Roman's Math scores have been improved.

2. A group of students submitted a report on renewable energy. Which of the following rephrases the sentence above?

   A. A report on renewable energy was submitted by a group of students.
   B. A report on renewable energy is submitted by a group of students.
   C. A report on renewable energy were submitted by a group of students.
   D. A report on renewable energy had been submitted by a group of students.

3. Had the truck driver been more careful, the accident

   A. will not have happen.
   B. would not have happened.
   C. had not happened.
   D. have not happened.

4. Men and women differ in childhood socialization. Girls create friendships by exchanging secrets while boys establish bonds by doing things together. Which of the following is a good paraphrase for this passage?

   A. There is gender difference among children as girls like spilling secrets while boys like playing games.
   B. There are gender differences in childhood socialization since girls like sharing secrets and boys like doing things as a group.
   C. Girls' bond over sharing secrets and boys' preference for doing activities together show gender differences when children socialize.
   D. Girls like intimate sharing of secrets while boys enjoy playing games, so they are different in their childhood socialization.

5. Which of the following sentences has a different meaning?

   A. Technology-mediated communication which uses various media has changed how people build relationships.
   B. Technology-mediated communication has changed how people use various media to build relationships.
   C. Technology-mediated communication has changed how people build relationships through various media.
   D. Technology-mediated communication through various media has changed how relationships are built among people.

6. “Leadership is not about education or job experience. It is not about power or charisma. And it is not about social class or distinction. As John Maxwell once wrote, ‘Leadership is influence. Nothing more, nothing less.’ And by this definition, every man, woman and child in this nation of 90 million is a leader in his or her own right.” - John Xavier R. Valdes (2009)

Which of the following restates the author’s main idea?

A. Anyone can be a leader who belong in this nation.
B. Anyone who has power and charisma can be a leader.
C. Anyone is capable of leadership which is defined as influence.
D. Anyone with an education that is respectable has leadership.

7. [1]A strand of spider’s silk is one of the strongest substances in the world. [2]It can hold five times more weight than a similar strand of steel. [3]The silk is extremely elastic. [4]A strand can stretch to twice its original length before breaking.

How can this paragraph be improved?

A. Use “Moreover” to begin sentence 3 to improve coherence.
B. Add the phrase “of spider’s silk” in sentence 4 to improve clarity.
C. Mention examples of other substances to improve content.
D. Replace sentence 2 with another detail to improve unity.

8. [1]**Telescopes** opened our eyes to the modern age of astronomy. [2]It was Galileo who first used this instrument to observe the skies up close. [3]Through the telescope, Galileo discovered that moons orbit around Jupiter. [4]Scientists after him then discovered that there are eight moons in the said planet. [5]Early telescopes were able to show that the sun and not the Earth is the center of the universe. [6]The more advanced telescopes that came later revealed geography and weather on the planets in the solar system. [7]Telescopes also helped in studying phenomena in the physical world like the speed of light and gravity. [8]The wise use of telescopes made us better understand our universe.

What is the purpose of sentence 8?

A. To draw an inference
B. To provide an illustration
C. To conclude the paragraph
D. To restate the first sentence

9. Same text as item #8 (Telescopes).

How did telescopes help in discovering the wonders in space?

A. Telescopes studied gravity and speed of light.
B. Scientists used telescopes to learn about planets.
C. Galileo discovered moons orbiting around Jupiter.
D. Astronomy became modern because of telescopes.

10. Same text as item #8 (Telescopes).

The use of telescopes led to important discoveries. Which sentences support this?

A. Sentences 3 and 5
B. Sentences 1 and 8
C. Sentences 2 and 6
D. Sentences 6 and 7

11. [1]**Renewable energy** is more cost-efficient and environment-friendly than fossil fuels. The process of generating it relies on wind, sun, water, and organic matter. [2]Since these energy sources are abundant and easily replenished, the cost of electricity is not too expensive. [3]In contrast, fossil fuels depend on limited resources that may eventually deplete, thus the cost of electricity can considerably increase. [4]Electricity generated from renewable sources is also more beneficial to nature. [5]Technologies that produce renewable energy have minimal emissions that harm the atmosphere, while coal-fired power plants release harmful emissions that contribute to global warming.

What pattern of paragraph development is evident in the passage?

A. cause-effect
B. problem-solution
C. definition by example
D. comparison-contrast

12. Same text as item #11 (Renewable energy). If you are to use the author's claims to advocate the use of renewable energy, which of the following should be emphasized?

A. The reduced cost of electricity helps consumers.
B. The environment benefits from the use of renewable energy.
C. The use of renewable energy benefits people and the environment.
D. The need for alternative energy resource demands increased attention.

13. Same text as item #11 (Renewable energy). An infographic based on the passage will be designed to inform the public about the advantages of renewable energy. How should the information be presented?

A. Enumerate the disadvantages of fossil fuels.
B. Describe the process of producing renewable energy.
C. Draw charts that indicate difference in cost of electricity.
D. Show a comparison of renewable energy and fossil fuels.

14. Which underlined part of the sentence shows an ERROR?

<u>I hope our varsity win</u>
A
<u>the basketball championship</u>
B
<u>because the players are</u>
C
<u>working so hard.</u>
D

15. Which underlined part of the sentence shows an ERROR?

Ham and cheese are
A
my favorite sandwich, while
B
water and pineapple juice are
C
my favorite drinks.
D

16. Which underlined part of the sentence shows an ERROR?

My baby sister always falls
A
asleep whenever
B
I sings to
C
her favorite song.
D

17. Choose the option that best expresses the same idea as the sentence below.

The cancellation of the Taal field trip turned out to be a blessing in disguise because all who went to Tagaytay are still stuck in traffic jams until now.

A. If not for the typhoon, the Taal field trip wouldn't have been cancelled and also no traffic jams in Tagaytay now.
B. It's a good thing that the Taal field trip was cancelled because of the typhoon and the traffic jams.
C. The cancellation of the Taal field trip was an unexpected flash of luck.
D. The cancellation of the Taal field trip was disappointing, but it turned out for the best after all.

18. Choose the option that best expresses the same idea as the sentence below.

I know I will pass the scholarship test because I've prepared well for it.

A. I will pass the scholarship test because I know I've prepared well for it.
B. I will pass the scholarship test because I've prepared well for it I know.
C. I've prepared well for it, so I know I will pass it.
D. I've prepared well for the scholarship test, so I know I will pass it.

19. Which of the following pairs of sentences is the conjunction YET be best used?

A. The boy found money in the classroom. He surrendered it to the teacher.
B. The little girl likes the color blue. She also likes the color yellow.
C. The mother promised to bring her son to the movies. He finished his assignments on time.
D. The student is not feeling well. She still attended her classes.

20. ***Article***: **"Mobile Phones"**

The Philippines is known as the texting capital of the world. Filipinos send over 200 million texts daily, ten times the per capita world average. Texting allows Filipinos to express themselves in new ways. They text what they would not normally say in a face-to-face encounter. This has led to new ways of relating with others as well as opened areas of inner-subjective reflection. New and radical identities become possible.

However, these technologies have also had less immediately beneficial consequences. Cell phone theft is now a major criminal problem in urban areas. Youth gambling has also become a major concern, given its close association with recreational texting. But civil society has also used it to organize political protests, aiding in the overthrow of President Estrada in January 2001. This capacity of CMICTs to mobilize people has also been reported for countries such as Venezuela during its current strife. CMICTs enable what are referred to as "smart mobs," loosely organized groups capable of micro-coordinating their activities for specific purposes.

Smart mobs differ from political demonstrations by the lack of a controlling center. Instead, they consist of loose networks, often P2P (person-to-person) linkages resulting in the close coordination of otherwise independent members. The model of center-**periphery** or a central hierarchy is replaced by multicentric nodes of mobilization. Each node is autonomous but capable of micro-coordinating its movements with other nodes for a specific and often single-issued end. Their relative autonomy allows for diverse nodal centers representing distinct interests to participate collectively. After such events, each node reverts to its original and individual condition.

Source: Pertierra, Raul. "Mobile Phones, Identity and Discursive Intimacy." *Human Technology*, Vol. 1, no. 1, 2005, pp. 23-44.

The word PERIPHERY is closest in meaning to _____.

A. boundary
B. core
C. flank
D. margin

21. *Refer to "Mobile Phones" (article included in item #20)

The article claims that texting allows Filipinos to express what they would not normally say in a face-to-face encounter. This advantage may also have a most harmful effect in that _____.

A. Someone could text others the feelings he's been keeping to himself
B. Someone could use text messaging as a way to play pranks on others
C. Someone could use text messaging to incite rebellion against the government
D. Someone could use text messaging to scam the unwary of their money

22. *Refer to “Mobile Phones” (article included in item #20)

Below are the author’s possible purposes in writing the article.

Determine the author’s main purpose by judging their **best order** of relevance from most to least relevant.

1. Analyze the disadvantages of using text messaging services
2. Compare smart mobs with demonstrations with controlling centers
3. Discuss how text messaging services are used to mobilize people
4. Examine the benefits of using text messaging services

A. 2-3-4-1
B. 2-4-1-3
C. 3-2-4-1
D. 3-4-1-2

23. *Refer to “Mobile Phones” (article included in item #20)

According to the article, Filipinos send over _____ text messages daily.

A. 200,000
B. 2,000,000
C. 20,000,000
D. 200,000,000

24. Yumi began working in the bank in 2009. She still works in the same bank now and recently received a Loyalty Award. Which sentence is true about Yumi?

A. Yumi is working in the bank since 2009.
B. Yumi was working in the bank since 2009.
C. Yumi has been working in the bank since 2009.
D. Yumi had been working in the bank since 2009.

25. The number of teen mothers continue to increase. Stronger programs on sex education and responsible parenting are needed.

Which of the following is a good paraphrase for this passage?

A. Programs on sex education and responsible parenting address the problem of teenage mothers.
B. Sex education and responsible parenting programs must be developed to address the growing number of teenage pregnancies.
C. Teenage pregnancies can be prevented by stronger programs on sex education and responsible parenting.
D. The number of teenage mothers continuously grow that better programs on sex education and responsible parenting are a must.

26. Which of the following sentences has a different meaning?

A. Today, the result of the qualifying examination which I took last month will be released.
B. The result of last month's qualifying examination which I took will be released today.
C. The result of the qualifying examination today is what I took last month.
D. The result of the qualifying examination that I took last month will be released today.

27. [1]Mathematics is the key to opportunity. [2]No longer just the language of science, mathematics now contributes in direct and fundamental ways to our daily life and nation building. [3]For students, it opens doors to careers. [4]For citizens, it enables informed decision. [5]For nations, it provides knowledge to compete in a technological economy. [6]To participate fully in the world of the future, we must tap the power of mathematics.

According to the passage, why is Mathematics considered important?

A. Mathematics make daily life more manageable as math knowledge guide in making practical decisions.
B. Mathematics inform nations to become more competitive in the global economy through adapting relevant technologies.
C. Mathematics helps students find financially and professionally rewarding careers in different fields, thus improving the quality of their lives.
D. Mathematics does not only provide opportunities for improving personal and professional lives of people but also opportunities for developing the economy of a nation.

28. Same text as item # 27 (Passage on Mathematics)

Mathematics is the key to opportunity. Which sentence does not directly support this?

A. Sentences 3
B. Sentences 4
C. Sentences 5
D. Sentences 6

29. Same text as item # 27 (Passage on Mathematics)

What is the purpose of sentence 6?

A. To draw an inference
B. To provide an illustration
C. To conclude the paragraph
D. To restate the first sentence

30. [1]Metabolism is a biochemical process wherein what we eat and drink are converted into energy. [2]Calories in food and beverages are combined with oxygen to release energy our body needs. [3]The number of calories burned by the body to carry out its basic functions, like breathing and growing cells, is technically called metabolic rate—also known as metabolism. [4]There are several factors that determine how much calories our body burns

each day. [5]Body size, sex, and age are some of these factors. [6]Digesting food and physical activity also affect one's basal metabolism.

What pattern of paragraph development is evident in the passage?

A. cause-effect
B. classification
C. process
D. definition

31. Same text as item # 30 (Passage on Metabolism)

If you are to explain the effectiveness of the paragraph in achieving its purpose, which of the following will NOT support your claim?

A. Relevant details were included.
B. Technical terms were clarified.
C. Examples were used to explain concepts.
D. Research data were used to validate the information.

32. Same text as item # 30 (Passage on Metabolism)

An infographic based on the passage will be designed to illustrate "Metabolism." How should the information be presented?

A. Construct a paragraph that explains "Metabolism" as a process.
B. Draw a concept map plotting the important details about "Metabolism."
C. Illustrate the digestive system that shows a graphic representation of metabolic rate.
D. Make a table that indicates the factors that affect metabolic rate.

33. Same text as item # 30 (Passage on Metabolism)

You need to state the gist of the passage in a sentence. Which of the following do you think best captures it?

A. Metabolism is the process of burning calories to support body functions.
B. Metabolism is affected by several factors like age and hormones.
C. Metabolism support digestion and physical activity.
D. Metabolism is another term for metabolic rate.

34. Which underlined part of the sentence shows an ERROR?

Physics are
A
the science concerned with
B
the qualities and properties
C
of matter and energy.
D

35. Which underlined part of the sentence shows an ERROR?

Rock and roll are
A
the kind of music his mother
B
listened to when
C
she was growing up.
D

36. Which underlined part of the sentence shows an ERROR?

The 12-year-old boy,
A
along with his classmates
B
and their parents,
C
are going to the amusement park.
D

37. Which underlined part of the sentence shows an ERROR?

Lucia's
A
father's
B
nephew is also
C
his cousin.
D

38. "A Eulogy of Roaches" (an excerpt) Bienvenido Lumbera

Blessed are the cockroaches.

In this country they are
the citizens who last.
They need no police
to promulgate their peace
because they tolerate
each other's smell or greed.

Friends to dark and filth,
they do not choose their meat.
They settle where they wish
and have no rent to pay.
Eviction is a word
quite meaningless to them
who do not have to own

their dingy crack of wall.
Not knowing dearth or taxes,
they increase and multiply.

Dying is brief and cheap
and thus, cannot affright.
A whiff of toxic mist,
an agile heel, a stick
-- the swift descent of pain
is also final death.

Their annals may be short,
but when the simple poor
have starved to simple death,
roaches still circulate
in cupboards of the rich,
the strong, the wise, the dead.

Based on your inference of the poem's message, which option do you think best explains its main idea?

A. Death comes to one and all.
B. Life is full of challenges.
C. Roaches will outlast humans.
D. The tough will survive.

39. Same text as item # 38 ("A Eulogy of Roaches")

The word EULOGY is closest in meaning to _____.

A. accolade
B. tribute
C. triumph
D. worship

40. Same text as item # 38 ("A Eulogy of Roaches")

The attitude of the author in the preceding poem is _____.

A. confused
B. detached
C. sad
D. scared

41. Same text as item # 38 ("A Eulogy of Roaches")

Roaches could be said to live with each other in peace and harmony because according to the poem, they tolerate their own kind's _____.

A. death
B. filth
C. pain
D. smell

42. Same text as item # 38 (“A Eulogy of Roaches”)

If you were to write the roaches in the poem an email, which parts of a mail should be considered the most important and in what order would you write them?

A. To, CC/BCC, Message, Subject
B. To, CC/BCC, Subject, Message
C. To, Subject, Message, Attachments
D. To, Subject, Message, Signature

43. Same text as item # 38 (“A Eulogy of Roaches”)

The word EVICTION in line 12 is closest in meaning to _____.

A. abandonment
B. departure
C. expulsion
D. suspension

SCIENCE

This section consists of test items in Biology, Chemistry, Physics, and Earth Science that will test your ability to accomplish various important scientific tasks.

1. Using a compound microscope, you want to view a plant cell under a magnification of 100x. Given that your eyepiece has a magnification of 20x, which objective should you use to achieve your desired magnification?

   A. 5x
   B. 20x
   C. 80x
   D. 100x

2. Plants produce their own food molecules through a process called photosynthesis. What do plants need for photosynthesis to push through?

   A. light
   B. light and water
   C. light, water and carbon dioxide
   D. light, water, carbon dioxide and oxygen

3. Imagine you have a pet animal called Diwata. Diwata is fat and she has a very thick fur coat. She also likes to sleep for months at a time. After a year in your house in the Philippines, you notice that Diwata is suffering. You then decide to release her back to her natural habitat. Which biome do you think is right for her?

   A. Desert
   B. Tundra
   C. Savanna
   D. Tropical rainforest

4. Flowering plants, such as daisies and orchids, belong to Magnoliophyta. Based from the phylogeny of their characters, the flower of a daisy and the flower of an orchid have been acquired from a common ancestor. If the daisy and the orchid's common ancestor has a flower, what can be inferred from this character?

   A. This character is said to be analogous.
   B. This character is said to be homologous.
   C. This character is said to be discontinuous.
   D. This character is said to be homoplasious.

5. How is spermatogenesis different from oogenesis?

   A. Sperm cells take longer time to develop unlike in egg cells
   B. Ovum is produced in continuous manner unlike in sperm production
   C. Spermatogenesis occurs at certain parts of childhood while oogenesis occurs only during adolescence
   D. There are prolonged interruptions in oogenesis unlike in spermatogenesis which occurs in constant manner

6. Rico, having a blood type AB, married Cora with a blood type B. They had four children with the following blood types: Child 1 - blood type AB, Child 2 – blood type B, Child 3 - blood type A and Child 4 – blood type B. By performing a testcross, what is the genotype of Cora?

   A. IBi
   B. IAi
   C. IBIB
   D. ii

7. In your Biology class, you look into a compound microscope. You notice that the organism you are trying to view is out-of-focus. Which microscope part do you adjust to sharpen the focus?

   A. mirror
   B. eyepiece
   C. fine adjustment knob
   D. coarse adjustment knob

8. For your birthday, a friend gave you a plant as a gift. You named the plant Pag-asa. Pag-asa is succulent, has many spines and barely no leaves. Which biome is Pag-asa's natural habitat?

   A. Desert
   B. Tundra
   C. Grassland
   D. Tropical rainforest

9. All the following are postulates of Kinetic Molecular Theory of gases, except:

   A. The collisions between molecules are elastic.
   B. The gas molecules are in constant, random motion.
   C. At lower temperatures, molecules have higher kinetic energies.
   D. The volumes of the molecules are negligible compared with the volume of the container.

10. Which of the following pairs of chemical formula and chemical name is correctly matched?

    A. $AlPO_4$: aluminum phosphate
    B. $CaSO_3$: calcium sulfide
    C. $LiNO_2$: lithium nitrate
    D. NaClO : sodium chlorite

11. Using your knowledge of electronegativity, which of the following compounds is not ionic?

    A. C_3H_8
    B. BaF_2
    C. $MgCl_2$
    D. NaI

12. You have a mixture of sand, copper and water in a beaker, and your task is to separate each component. Which experimental design will you follow to separate the components *most effectively*?

A. First, slowly decant the mixture to separate water from sand and copper, then distill the resulting mixture to separate copper and sand.
B. First, filter the mixture in a funnel to separate copper and sand from water, then recover copper from sand using a magnet.
C. First, recover copper from the mixture using a magnet, then distill to separate water and sand.
D. Centrifuge the mixture first, then slowly decant to separate water from copper and sand, then distill the resulting mixture to separate copper and sand.

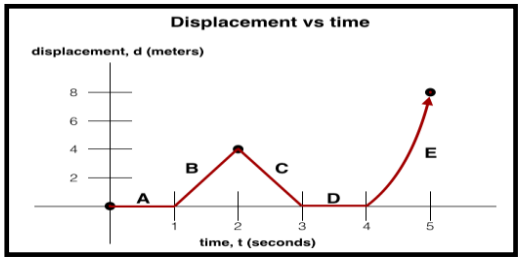
13. The red coloration of Poinsettia (*Euphorbia pulcherrima*) are caused by a combination of organic dyes found in the leaves. If you want to study these compounds, how would you design an experiment which will separate the pigments in the Poinsettia leaves?

A. First, boil the leaves to extract the mixture of dyes, filter, then distill the resulting solution.
B. First, boil the leaves to extract the mixture of dyes, filter, then centrifuge the resulting solution.
C. First boil the leaves to extract the mixture of dyes, filter, then evaporate the remaining solvent.
D. First, boil the leaves to extract the mixture of dyes, filter, then perform chromatography using the resulting solution.

14. Your group was tasked to determine the identity of an unknown compound. After performing several experiments, your group found that the unknown compound 1) is solid at room temperature, 2) dissolves in a cup of water and 3) conducts electricity when dissolved in water. The compound is likely to be:

A. Glucose, a covalent compound
B. Glucose, an ionic compound
C. Sodium chloride, a covalent compound
D. Sodium chloride, an ionic compound

15. The following graph shows the displacement vs time graph of a "GRAB TAXI" that you have boarded from home:



Which graph shows that the taxi is NOT moving?

A. A and D
B. D and C
C. B and E
D. E only

16. Which of the following will require the greatest amount of mechanical work?

A. Lifting a 2-kilogram box 6 meters high
B. Lifting a 3-kilogram box 5 meters high
C. Lifting a 4-kilogram box 4 meters high
D. Lifting a 5-kilogram box 3 meter high.

17. Which of the following consumed the greatest amount of energy?

A. a 20-watt incandescent bulb used for 24 hours
B. a 40-watt fluorescent lamp used for 8 hours
C. a 60-watt electric fan used for 6 hours
D. a 100-watt LCD TV used for 4 hours

18. Which of the following consumed the least amount of energy?

A. a 5-watt LED bulb used for 24 hours
B. a 20-watt incandescent bulb used for 12 hours
C. a 40-watt fluorescent lamp used for 10 hours
D. a 60-watt electric fan used for 6 hours

19. Energy within the oceans is distributed through which process?

A. conduction
B. convection
C. radiation
D. refraction

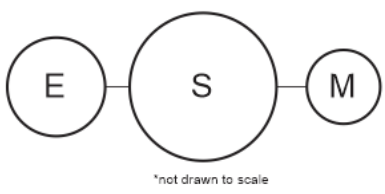
20. The Earth is heated by the Sun by which process?

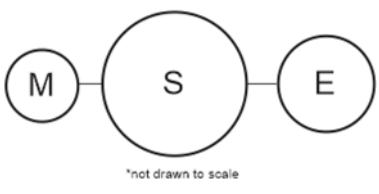
A. conduction
B. convection
C. radiation
D. refraction

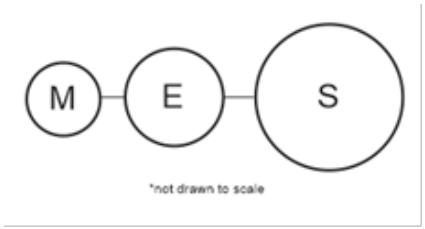
21. An object with what looks like a tail is visible at the sky for days. What object is this?

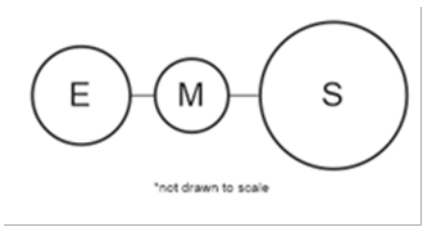
A. Asteroid
B. Comet
C. Meteor
D. Meteoroid

22. A total solar eclipse was last seen in the Philippines on Oct. 24, 1995. Which of the following images shows the correct configuration of the Earth, Moon, and Sun during that time?

A. 

B. 

C. 

D. 

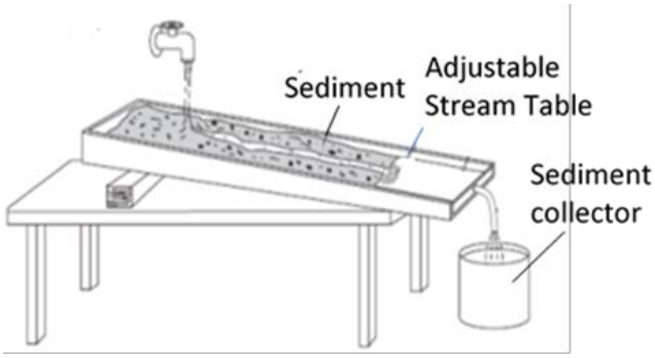
23. You observe that when you are looking at the front of your house at 8:00 AM, the sun is to the right of you. Returning to the same exact spot at 4:00 pm, you notice that the sun is now to the left of you. At which direction were you facing at 8:00 AM and 4:00 pm?

A. east
B. north
C. south
D. west

24. Mara poured saltwater solution on a cup of sand which she got from a beach in one of their outings. After a week she found out that a residue was left on the cup. The residue cemented the sand grains together, forming a rock-like hardened material. The residue is most likely similar to_____.

A. a clastic sedimentary rock
B. an extrusive igneous rock
C. a foliated metamorphic rock
D. an intrusive igneous rock

25. The illustration below shows how a delta is formed.



A mixture of sediment was placed on the closed-edge table. The faucet was turned on and allowed the sediment to flow downward. The sediment began forming at the lower end until a delta plane is formed. Using the illustration, how can a delta be formed without excessive mass movement?

A. Turn on the faucet with water running smoothly and adjust the table on a low slope.
B. Turn on the faucet with water running smoothly and adjust the table on a high slope.
C. Turn on the faucet with water running turbulently, then adjust the table on a low slope.
D. Turn on the faucet with water running turbulently, then adjust table on a high slope.

26. A typhoon warning has been raised in your area. You are trying to determine when the typhoon will arrive at your area. Which of the following information will you need to look up?

A. Diameter of the storm
B. Maximum wind speed
C. Location of landfall
D. Movement speed

27. What is the correct sequence of precautions to take before, during, and after a typhoon?

I. Stay away from flood waters, they may carry water-borne diseases
II. Check the roof and windows of your house for any damage or loose attachment
III. Monitor the weather reports and the weather outside
IV. Pack a bag with water, food, clothes, batteries, flashlights and other necessities

A. I – II – III - IV
B. III – II – I - IV
C. II – IV – I - II
D. IV – II – III – I

28. The slope angles, nature of slope material and water saturation are some of the factors controlling the mass wasting process. Which of the following is a recipe for landslides?

A. Low angle slope, soil, and wet conditions
B. High angle slope, soil, and wet conditions
C. Low angle slope, rock, and wet conditions
D. High angle slope, rock, and dry conditions

29. A typhoon warning has been raised in your area. You are trying to determine the nearest town that you can evacuate to to avoid the effects of the typhoon. Which of the following information will you need to look up?

A. Diameter of the storm
B. Maximum wind speed
C. Amount of Rainfall
D. Movement speed

30. Which of the following precautions SHOULD NOT be done while a typhoon is in your area?

A. Stay away from flood waters, they may carry water-borne diseases
B. Check the roof and windows of your house for any damage or loose attachment
C. Monitor the weather reports and the weather outside
D. Pack a bag with water, food, clothes, batteries, flashlights and other necessities

31. Ceres is a 1000-km diameter rocky body which orbits the sun. What is the correct classification of Ceres?

A. Asteroid
B. Comet
C. Meteor
D. Meteorite

32. Using a compound microscope, you want to view a plant cell under a magnification of 100x. Given that your eyepiece has a magnification of 10x, which objective should you use to achieve your desired magnification?

A. 10x
B. 90x
C. 100x
D. 110x

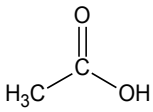
33. Imagine you have a pet fish called Kalayaan. You keep Kalayaan inside an aquarium, but she looks very weak. You then decide to add a tablespoon of salt into the water and this made her look healthy. After a year of taking care of her, you decide to release her back to her natural habitat so that she can reproduce freely. Which aquatic biome do you think is right for her?

A. River
B. Stream
C. Estuary
D. Freshwater Lake

34. Cactus and euphorbs have prominent sharp and pointed spines on the surface of their body. The spines of cactus and stem-succulent euphorbs is a character that arose from a common evolutionary origin. What can be inferred from this character?

A. This character is said to be analogous.
B. This character is said to be homologous.
C. This character is said to be discontinuous.
D. This character is said to be homoplasious.

35. Brielle loves the sour taste of vinegar. This sour taste is due to an organic compound called acetic acid. What is the functional group present in acetic acid?



Acetic acid

A. acid halide
B. alkyl halide
C. carboxylic acid
D. acid anhydride

36. Calcium phosphates are historically known as good material for tooth replacement, repair of large bone defects caused by tumors and as injectable cement. One simple way of producing calcium phosphate is by collecting it from the reaction of Calcium chloride and Sodium phosphate. Write the balanced chemical equation to produce calcium phosphate.

A. $CaCl_2 + Na_3PO_4 \rightarrow Ca_3(PO_4)_2 + NaCl$
B. $2CaCl_2 + Na_3PO_4 \rightarrow Ca_2PO_4 + 3NaCl$
C. $3CaCl_2 + 2Na_3PO_4 \rightarrow Ca_3(PO_4)_2 + 6NaCl$
D. $3CaCl_2 + Na_3PO_4 \rightarrow Ca_3(PO_4)_2 + 3NaCl$

37. Arrange the following steps to determine the empirical formula of a compound.

I. Determine the ratio by dividing the number of moles of each element by the lowest number
II. Compute for the number of moles from the given mass of each element.
III. Use the resulting ratio as the subscript in the formula
IV. Identify the mass of each element stated in the problem or from the percentage given.

A. IV, III, I, II
B. II, III, I, IV
C. II, I, III, IV
D. IV, II, I, III

38. What is the electronic configuration for a ground state element with a nuclear charge of +16?

A. 1s2 2s2 3s2 2p6 3p4
B. 1s2 2s2 2p2 3s6 3p4
C. 1s2 2s2 2p6 3s2 3p4
D. 1s2 2s2 2p6 3s1 3p5

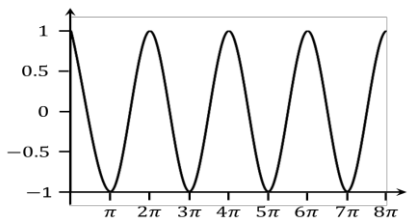
39. Which of the following nuclides have the same number of protons, neutrons and electrons?

A. ^{9}B (Z = 5)
B. ^{13}C (Z = 6)
C. ^{14}N (Z = 7)
D. ^{17}O (Z = 8)

40. Which of the following nuclides have the same number of protons, neutrons and electrons?

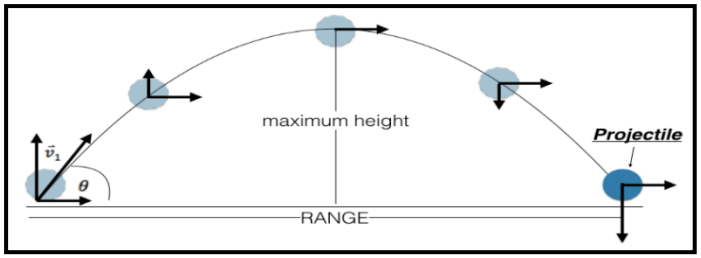
A. ^{9}B (Z = 5)
B. ^{13}C (Z = 6)
C. ^{15}N (Z = 7)
D. ^{16}O (Z = 8)

41. The propagation of a mechanical wave is described by the graph shown below. What is the wavelength of the wave?



A. π m
B. 2π m
C. 3π m
D. 4π m

42. A stone is thrown at an angle, θ, from the ground such that it becomes a projectile as shown in the figure below:



At what angle, θ, from the ground should the projectile be thrown so that it will have the maximum range?

A. 0°
B. 45°
C. 60°
D. 90°

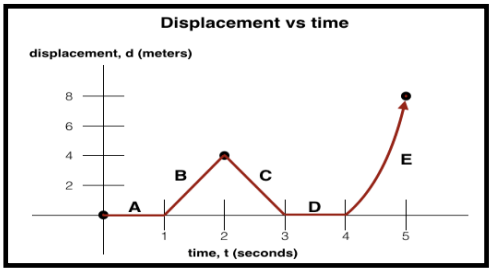
43. Ben's Monday morning school activities include the following:

I. Fifteen minutes of break time spent eating in a table at the canteen.
II. Twenty minutes to walk to the nearby lecture room in Science.
III. Two hours to attend the Science lecture-laboratory.
IV. Twenty-minute walk to a nearby canteen.
V. An hour to attend a lecture in Math.

If you are Ben, which two activities do you think requires a change of speed and are NOT reasonable in doing the activity?

A. I and III
B. III and IV
C. I, and V
D. II and IV

44. The following graph shows the displacement vs time graph of a tricycle that you have boarded in going from your home to the market.



What is the final displacement of the tricycle that you have boarded?

A. 0 m
B. 4 m
C. 8 m
D. 12 m

45. Zeon's Sunday trip from home using his bicycle is described by the following activities:

I. Two hours bus nonstop trip from home to the church 70 m away.
II. An hour spent to attendance the mass.
III. One-minute walk to the market 1 km away from the church;
IV. Thirty minutes spent to buy goods from Aling Susan's grocery store in the market.

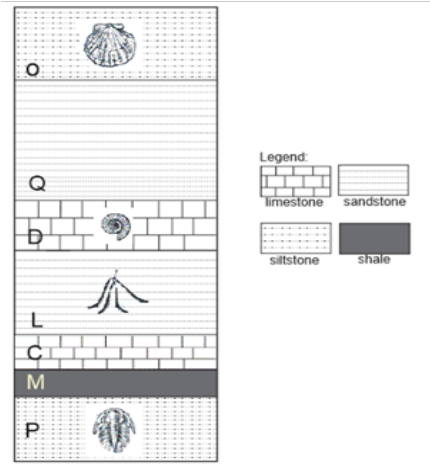
If you are Zeon, which two activities do you think are NOT reasonable and requires a change of speed in doing the activity?

A. I and II
B. II and III
C. I and III
D. I and IV

46. In a velocity versus time graph, how can a horizontal graph be interpreted?

A. maximum displacement
B. constant velocity
C. increasing speed
D. changing acceleration

47. What rock layers are older than the fossil in limestone D?



A. Siltstone P, shale M, limestone C, and sandstone L
B. Siltstone O and sandstone Q only
C. Siltstone P and sandstone L only
D. Siltstone O only

48. You come across a fossil that is believed to be petrified wood. You are curious to know how old this fossil is. What dating technique will you use to know the age?

A. Relative dating: superposition
B. Relative dating: fossil succession
C. Absolute dating: carbon dating
D. Absolute dating: potassium-argon (K-AR) dating

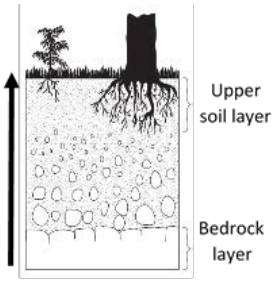
49. Which of the following properties affect the severity of the seasons all over the Earth?

A. Distance of the Sun from the Earth
B. The speed of the Earth's rotation
C. The tilt of the Earth
D. The circumference of the Earth

50. A typhoon warning has been raised in your area. You are trying to determine the possible damage that it might cause. Which of the following information will you need to look up?

A. Diameter of the storm
B. Maximum wind speed
C. Location of landfall
D. Movement speed

51. Study the diagram of soil development below which started from the underlying bedrock to the thick upper soil layer. What change would most likely to increase the thickness of the upper soil layer?



A. An increase in the air pressure
B. An increase in the biologic activity
C. A decrease in slope
D. A decrease of the amount of rainfall

52. One important discussion that should be tackled in classroom is the wise consumption of energy. Energy comes in two sources like renewable and non-renewable sources. Why is it very essential to learn about these sources in school?

A. It becomes a significant part of human lives to differentiate how renewable and non-renewable sources be used.
B. Knowing these sources of energy plays an important role for people to value resourcefulness and energy conservation.
C. The lifestyle is very much dependent on the utilization of these sources of energy.
D. All of these.

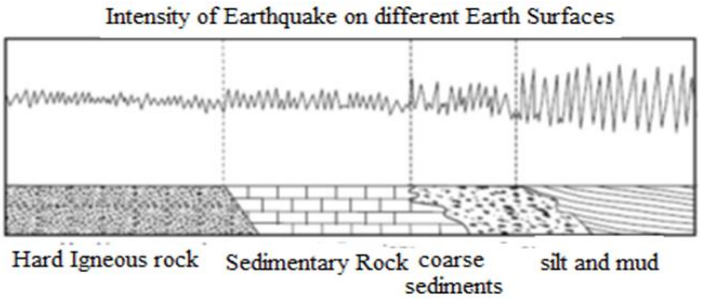
53. The slope angles, nature of slope material and water saturation are some of the factors controlling the mass wasting process. Which of the following is the least susceptible to landslide?

A. Low angle slope, fractured rock, and dry conditions
B. High angle slope, fractured rock, and wet conditions
C. Low angle slope, rock, and dry conditions
D. High angle slope, rock, and wet conditions

54. You were peeling hard boiled eggs when you remembered that the eggs were used as an analogy to the layers of the earth. Between which parts of the egg can the Moho be found?

A. the yolk and the albumen (white)
B. the yolk and the shell
C. the albumen (white) and the shell
D. the liquid and the solid albumen (white)

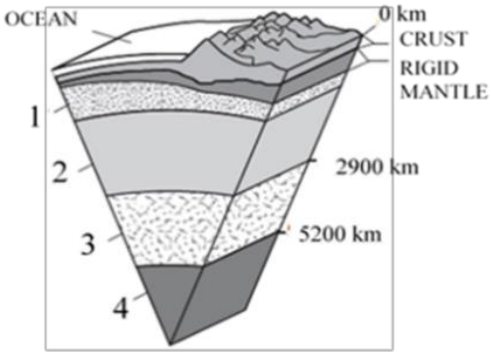
55. The intensity of earthquake that occurs on different parts of the Earth is shown in the diagram below.



In which type of rock or soil profile where the houses are built experience the greatest earthquake?

A. Coarse sediments
B. Hard igneous rock
C. Sedimentary rock
D. Silt and mud

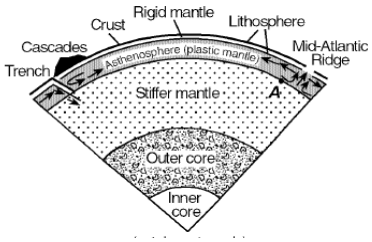
56. The diagram below represents the partial inner structure of the Earth. Different layers are represented by 1, 2, 3 and 4. Some depths below the Earth are also shown.



Which layer is mostly likely to contain solid nickel and iron?

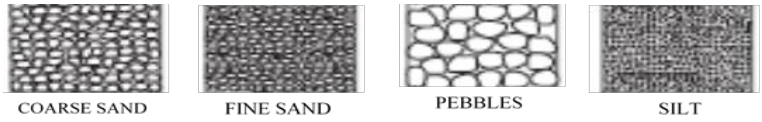
A. 1
B. 2
C. 3
D. 4

57. The illustration below shows a portion of the interior of the Earth. The location on the interface between layers is shown in Point A. The inferred slow circulation of the mantle is shown by the arrow. Describe the process shown by the arrow.



A. Conduction
B. Convection
C. Radiation
D. Insolation

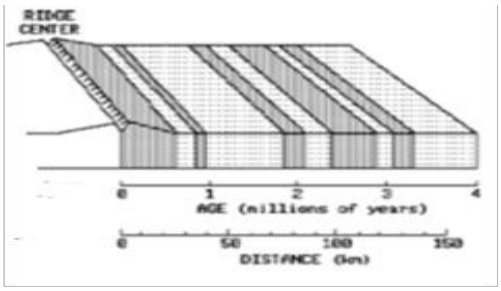
58. Equal volumes of sediments as shown below are mixed and poured into a column of water.

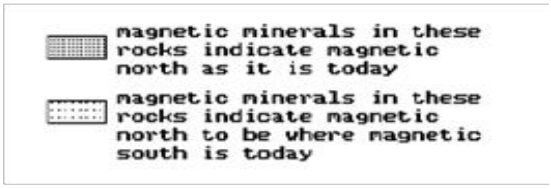


How will you pour the sediments to facilitate proper settling down into the column of water?

A. pebbles – silt – coarse sand – fine sand
B. pebbles – coarse sand - fine sand - silt
C. coarse sand – fine sand – pebbles – silt
D. coarse sand – pebbles – silt – fine sand

59. The diagram below illustrates the magnetic orientation of igneous rock on the right-side part of a seafloor along a mid-ocean ridge. The age of the igneous rock and its distance from the ridge center are shown.

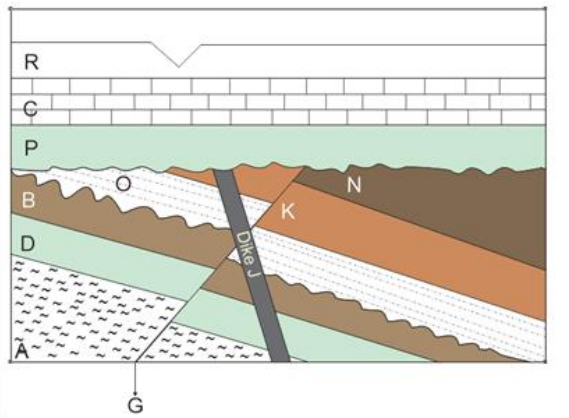




What evidence is manifested by the occurrence of high-heat flows at the center of the ridge?

A. destruction of oceanic crust
B. destruction of continental crust
C. existence of ancestral mountains
D. existence of rising mantle convection currents

60. What is the correct sequence of events from oldest to youngest?



A. A-D-B-O-K-N-G-J-P-C-R
B. A-D-B-O-K-N-P-C-R-G-J
C. P-C-R-A-D-B-O-K-N-J-G
D. R-C-P-J-G-N-K-O-B-D-A

MATHEMATICS

In this sub-test, you will be performing tasks that will measure your ability to comprehend qualitative relationships and their representations.

1. Which of the following defines a one-to-one function?

   A. $f(x)=\frac{1}{2}x+3$

   B. $f(x)=3x^2-1$

   C. $f(x)=x^2+x+1$

   D. $f(x)=5|x|$

2. Which of the following statements are true?

   I. A rectangle is a parallelogram.
   II. A square is a rhombus
   III. A square is a rectangle.
   IV. A parallelogram is a rhombus.

   A. I and II only
   B. I and IV only
   C. I, II and III only
   D. I, II, III and IV

3. Which of the following propositional forms may represent the proposition below?

   "If two sides of a quadrilateral are parallel and congruent, then the quadrilateral is a parallelogram."

   A. $P\wedge(Q\rightarrow R)$

   B. $(P\vee Q)\rightarrow R$

   C. $P\vee(Q\rightarrow R)$

   D. $(P\wedge Q)\rightarrow R$

4. If $\sin\beta=-\frac{3}{5}$ and $\tan\beta>0$, what is the exact value of $\cos^2\beta-\sin^2\beta$?

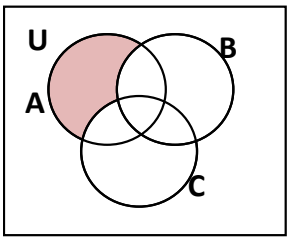
   A. $-\frac{1}{5}$

   B. $\frac{7}{25}$

   C. 1

   D. -1

5. Use set notation to describe the shaded region.



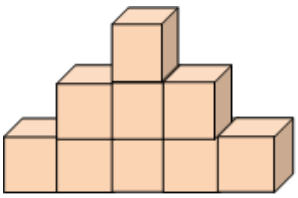
A. $A \cap (B \cup C)^c$

B. $A \cup (B \cap C)^c$

C. $A \cap (B \cap C)^c$

D. $A^c \cap (B \cup C)$

6. Dianne is making a triangular wall with building blocks. The top row has one block, the second row has three, and the third has five, and so on. How many rows can she make with a set of 225 blocks?



A. 12
B. 13
C. 14
D. 15

7. At a rally, protesters outnumbered the policemen by 12 to 1. Seventy-two arrests were made averaging 3 for every 2 policemen. How many protesters attended the rally?

A. 48
B. 144
C. 576
D. 720

8. A student downloaded 6 music files to a portable MP3 player. In how many different orders can the songs be played?

A. 6
B. 24
C. 120
D. 720

9. A box contains ten balls. Each ball is labelled such that each ball corresponds to a prime number less than 30. If two balls are drawn from the box, what is the probability that the sum of the numbers written on them is even?

A. 0
B. 9/10
C. 4/5
D. 1

10. Let $a, b, r,$ and s be non-zero real numbers. Consider the geometric sequences

$a, ar, ar^2, ar^3, \ldots$ and $b, bs, bs^2, bs^3, \ldots$

Which of the following sequences is also geometric for any r and s with $r = s$?

A. $ab, abrs, abr^2s^2, abr^3s^3, \ldots$

B. $ab, abr, abs, abr^2, abs^2, \ldots$

C. $a + b, a + b + r + s, a + b + r^2 + s^2, a + b + r^3 + s^3, \ldots$

D. $a - b, a - b + r - s, a - b + r^2 - s^2, a - b + r^3 - s^3, \ldots$

11. Suppose that $a + b = 2$. If the line given by $ax + by = 16$ passes through (3, -2), what is the value of a and b?

A. $a = 10, b = -8$
B. $a = 8, b = -6$
C. $a = 6, b = -4$
D. $a = 4, b = -2$

12. Janine invested Php 80,000 into a venture that pays 3.5% annual simple interest. How much will she earn after a year?

A. Php 28,000
B. Php 2,800
C. Php 108,000
D. Php 82,000

13. Emma decided to invest Php 120,000 in an internet café and a photo booth. The internet café and the photo booth pay monthly interest 5% and 4.5%, respectively. If she wants to earn a total of Php 5,800 a monthly from the two businesses, how much must she allot to each business?

A. Internet cafe: Php 100,000, Photo booth: Php 20,000
B. Internet cafe: Php 90,000, Photo booth: Php 30,000
C. Internet cafe: Php 80,000, Photo booth: Php 40,000
D. Internet cafe: Php 70,000, Photo booth: Php 50,000

14. What should be multiplied to the binomial $x - 2y$ so that the product is a trinomial?

A. $2y$
B. $x - 2y$
C. $x + 2y$
D. $x^2 + 2y + 4y^2$

15. Which of the following is true about right triangle ABC?

I. The hypotenuse is the longest side.
II. The sum of the degree measures of its internal angles is 180 degrees.
III. The sum of the squares of the lengths its legs is equal to the square of the length of its hypotenuse.

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

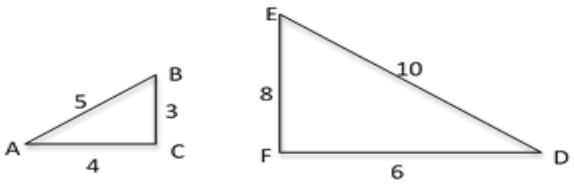
16. Given the following investment opportunities with simple annual interest rates and duration:

A. 10% per annum for 5 years
B. 13% per annum for 4 years

What is the better investment opportunity and why?

A. Investment A because the investment duration is longer
B. Investment B because the interest rate is higher
C. Investment A because the total interest earned is higher
D. Investment B because the total interest earned is higher

17.



Which of the following expressions is equal to sin A?

I. cos B
II. cos D
III. cos E

A. I only
B. II only
C. I and II only
D. I and III only

18. Given:

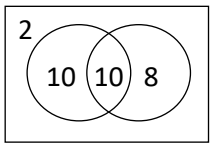
A = {Diego, Jepoy, Jasmine, Ivy, Emilia}

B = {Arnaldo, Emilia, Raul, Diego, Maja}

If sets A and B represent the friends of Arlene and Bayani, respectively, which of the following notations represent the common friends of Arlene and Bayani?

A. $A \cup B$
B. $A \cap B$
C. $A - B$
D. $B - A$

19.



A survey was conducted on 30 people on their TV viewing preference and is presented in a Venn diagram shown above. Which of the following narrative best describes the Venn diagram?

A. 10 are Kapamilya, 10 are Kapuso, and 8 are Kapatid
B. 20 are Kapamilya, 18 are Kapuso, and 2 are Kapatid
C. 10 are Kapamilya, 8 are Kapuso, while 2 are neither Kapamilya nor Kapuso
D. 20 are Kapamilya, 18 are Kapuso, while 2 are neither Kapamilya nor Kapuso

20. Given the sequence of first nine prime numbers:
2, 3, 5, 7, 11, 13, 17, 19, 23

Can four numbers be chosen to form an arithmetic sequence?

A. Yes, the arithmetic sequence is 3, 5, 7, 11.
B. Yes, the arithmetic sequence is 3, 7, 11, 17.
C. Yes, the arithmetic sequence is 5, 11, 17, 23.
D. No, it is not possible.

21. Twenty chocolate candies were placed in a jar and mixed thoroughly: 8 Curly Tops and 12 Flat Tops. Two students were asked to get a candy from the jar, one at a time, without looking into the jar. The first student got a Flat Top while the second student did not show his/her chocolate candy. If you were asked to pick a chocolate candy from the remaining candies in the jar, what would be the more likely outcome?

A. The chocolate candy is a Flat Top.
B. The chocolate candy is a Curly Top.
C. A Curly Top or Flat Top would have the same probability of being picked.
D. It depends on what the second student picked from the jar.

22. If you rolled two six-sided dice simultaneously, which of the following would be the most likely outcome?

A. The sum is odd.
B. The sum is even.
C. The product is odd.
D. The product is even.

23. If $x = 13, y = 17$ and z are sides of a triangle, which of the following numbers is a possible value of z?

A. 35
B. 33
C. 31
D. 29

24. The elements of the sequence 1, 3, 6, 10, 15, 21, … are called triangular numbers. Which of the following statements are true about the sequence?

I. 55 is a triangular number.
II. The nth triangular number t_n is given by $t_n = \frac{n(n+1)}{2}$.
III. The sum of two consecutive triangular numbers is a perfect square.

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

25. Let X, Y and Z be sets. Which of the following equalities is NOT ALWAYS true?

A. $(X \cap Y \cap Z)^c = X^c \cup Y^c \cup Z^c$
B. $(X \cup Y \cup Z^c)^c = X^c \cap Y^c \cap Z$
C. $(X - Y) \cup Z = (X \cup Z) \cap (Y \cup Z)$
D. $(X \cup Y) \cap Z^c = (X - Z) \cup (Y - Z)$

26. What should be multiplied to $a^2 - ab + b^2$ so that the product is a binomial?

A. ab
B. $a + b$
C. $a - b$
D. $a^2 + ab + b^2$

27. When graphed in the Cartesian plane, which of the following equations passes through quadrant I?

A. $x + 2 = 0$
B. $y + 2 = 0$
C. $x + y - 2 = 0$
D. $x + y + 2 = 0$

28. Given the following investment opportunities with simple annual interest rates and duration:

I. 10% per annum for 5 years
II. 13% per annum for 4 years
III. 15% per annum for 3 years

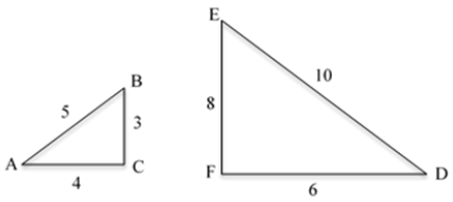
Arrange the investment opportunity from best opportunity to good opportunity.

A. I, II, III
B. II, I, III
C. III, II, I
D. II, III, I

29. A farmer borrowed Php 100,000 from a cooperative with an annual simple interest rate of 10%. Which of the following computation shows the amount the farmer owes the cooperative after 2 years?

A. $100{,}000 \times 1.1 = 110{,}000$
B. $100{,}000 \times 1.1 = 110{,}000 \rightarrow 110{,}000 \times 1.1 = 121{,}000$
C. $100{,}000 \times 1.2 = 120{,}000$
D. $100{,}000 \times 1.2 = 120{,}000 \rightarrow 120{,}000 \times 1.2 = 144{,}000$

30.

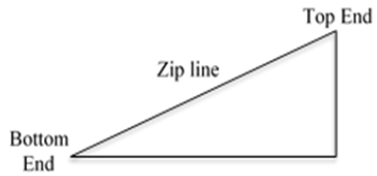


Which of the following expressions is correct?

I. cos A = cos D
II. cos A = sin B
III. cos D = sin E

A. I only
B. I and II only
C. I and III only
D. II and III only

31.



From the top end of 200-m long zip line, the angle of depression to the bottom end is 20 degrees. Assuming the zip line is a straight line, which of the following expressions show how to compute the height of the top end of the zip line?

A. $200 \sin 20°$
B. $200 \cos 20°$
C. $200 \sec 20°$
D. $200 \csc 20°$

32. Given:

A = {Diego, Jepoy, Jasmine, Ivy, Emilia}
B = {Arnaldo, Emilia, Raul, Diego, Maja}

If sets A and B represent the friends of Arlene and Bayani, respectively, what does A ∪ B represent?

A. the common friends of Arlene and Bayani
B. the combined friends of Arlene and Bayani
C. the friends of Arlene who are not friends of Bayani
D. the friends of Bayani who are not friends of Arlene

33. Given the arithmetic sequence of six numbers:

6, 12, 18, 24, 30, 36

Which three numbers can be chosen to form a geometric sequence?

A. 6, 12, 24
B. 6, 18, 30
C. 12, 24, 36
D. 24, 30, 36

34. If you rolled two six-sided dice simultaneously, which of the following would be the most likely outcome?

A. Exactly one die is even.
B. At least one die is even.
C. Both dice are even.
D. The sum is even.

35. What is the domain of the function defined by $f(x) = \sqrt{x^2 - 1}$?

A. $(-\infty, -1] \cup [1, +\infty)$
B. $[-1, 1]$
C. $(-1, 1)$
D. $(-\infty, -1) \cup (1, +\infty)$

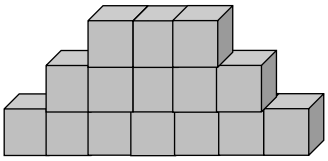
36. Which of the following propositional forms may represent the proposition below?

"If the diagonals of a quadrilateral bisect each other and they are perpendicular, then the quadrilateral is a rhombus."

A. $(P \wedge Q) \rightarrow R$
B. $P \vee (Q \rightarrow R)$
C. $(P \vee Q) \rightarrow R$
D. $P \wedge (Q \rightarrow R)$

37. Dianne is making a triangular wall with building blocks. The top row has three blocks, the second row has five, and the third has seven, and so on. How many rows can she make with a set of 120 blocks?

A. 10
B. 11
C. 12
D. 13



38. A committee of 10 students must select a president, vice-president, a secretary and a treasurer. In how many possible ways can this be done?

A. 5040
B. 720
C. 210
D. 10

39. Assume that $a + b = -3$. If the line given by $ax + by = 18$ passes through (-1, 2), what is the value of a and b?

A. $a = -10, b = 7$
B. $a = -9, b = 6$
C. $a = -8, b = 5$
D. $a = -7, b = 4$

40. Jhoanna went to the Gracious Shepherd to buy snacks which is a mixture of peanuts and green peas. The peanuts and green peas are being sold there for 50 cents per 10 grams, and 80 cents per 10 grams, respectively. If she wants a kilogram of the snack for Php 62.00, what must be the composition of the mixture?

A. Nuts: 650 grams, Green peas: 350 grams
B. Nuts: 600 grams, Green peas: 400 grams
C. Nuts: 550 grams, Green peas: 450 grams
D. Nuts: 500 grams, Green peas: 500 grams

MECHANICAL-TECHNICAL

In this sub-test, you will be performing tasks that will measure your ability to acquire information about everyday physics and to comprehend mechanical relationships. It consists of mechanical and electrical problems, as well as items that deal with physical forces.

1. A crate is sitting in the center of a flatbed truck. As the truck accelerates to the east, the crate moves with it, not sliding on the bed of the truck. In what direction is the force exerted by the bed of the truck on the crate?

   A. Sideways
   B. To the East
   C. To the West
   D. There is no friction force, because the crate isn't sliding

2. Arrange through which medium the sound travel does from the slowest to fastest.

   I. Solid
   II. Liquid
   III. Gas

   A. I, II, III
   B. I, III, II
   C. II, III, I
   D. III, II, I

3. A current of 5 µA flows through a wire. How many coulombs of charge have passed through the wire in 10 seconds?

   A. 2×10^{-5} coulombs
   B. 5×10^{-5} coulombs
   C. 15×10^{-5} coulombs
   D. 50×10^{-5} coulombs

4. How can gears be used to change the speed of a machine?

   A. use more gears
   B. use two gears of the same size
   C. use two gears of different sizes
   D. use two large gears

5. Choose the most closely related tool or object for the tool given below.

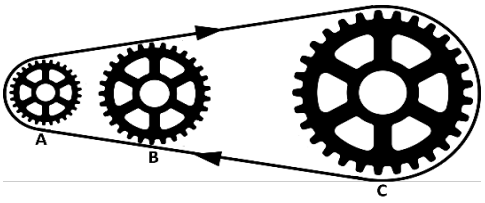
A. 

B. 

C. 

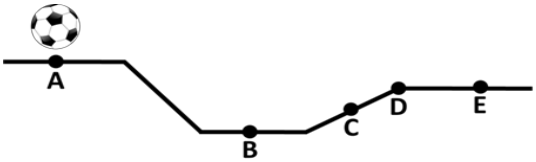
D. 

6. In the figure shown below, gears A, B and C are connected by a chain. The diameters of the gears are 2 inches, 4 inches, and 8 inches respectively. If gear A is turning at 20 revolutions per minute (RPM), what is the turning rate of gear C?



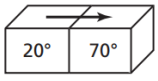
A. 5 RPM
B. 20 RPM
C. 40 RPM
D. 80 RPM

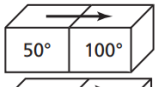
7. You are playing with a ball on an uneven surface as shown in the figure. If the ball moves from point A to point D across the surface, what is the difference between the gravitational potential energy at point A and point B?

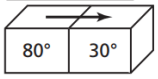


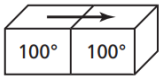
A. The potential energy at A is greater than the potential energy at B
B. The potential energy at B is greater than the potential energy at A
C. The lowest potential energy is located at point A.
D. The lowest potential energy is located at point B.

8. The pictures below show pairs of metal blocks and their temperatures. Which of these correctly shows the direction that heat energy will move?

A. 

B. 

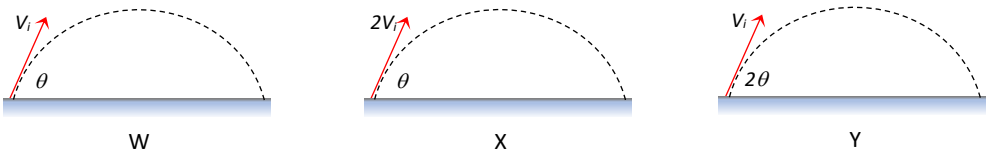
C. 

D. 

9. During your piano recital, a pure musical note causes a thin wooden panel in the school theater to vibrate with the same frequency. This is an example of _____.

A. an overtone
B. diffraction
C. resonance
D. interference

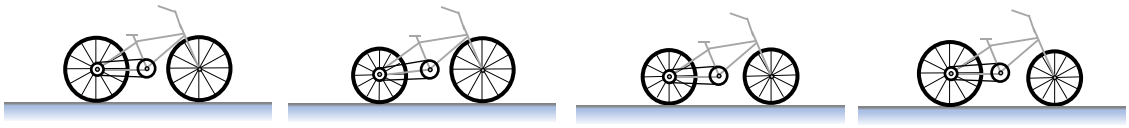
10. In a projectile motion: for a given initial velocity V_i and angle θ which is less than 60°, determine the projectile that will reach the farthest.



W X Y

A. Projectile W
B. Projectile X
C. Projectile Y
D. Both Projectile X and Y

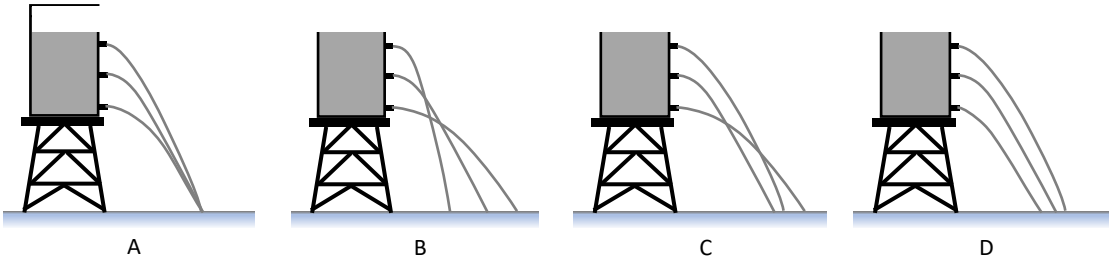
11. Given the set of front and rear wheels, which bicycle will reach a greater distance upon one rotation of the pedal?



W X Y Z

A. Bicycles W and Z
B. Bicycles X and Y
C. Bicycle W only
D. Bicycle X only

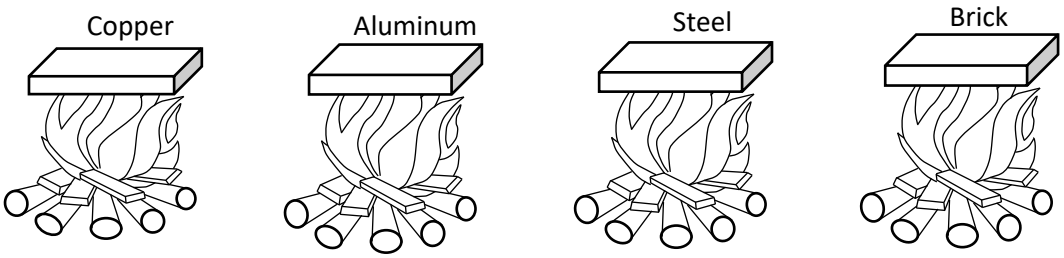
12. Multiple holes of the same sizes are drilled on one side of the container but on different height. The container is filled with water, which of the following will be the flow of the water jet on the holes.



A B C D

A. Situation A
B. Situation B
C. Situation C
D. Situation D

13. Different types of blocks are subjected to burning wood. If the same amount of heat from the burning wood is absorbed by the rectangular block at a given short time interval, which block has the hottest top surface? Provided that all blocks have the same length, width and thickness.



A. Copper
B. Aluminum
C. Steel
D. Brick

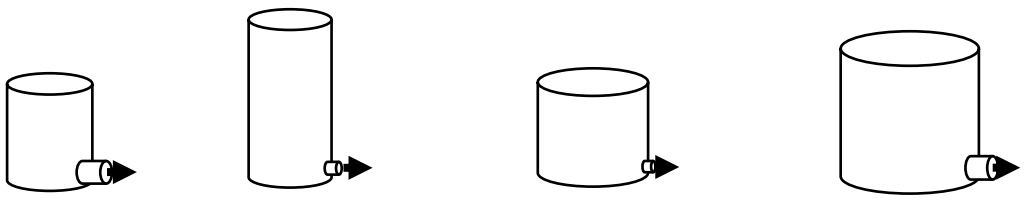
14. The water supply in your house comes from a water tank that is located beside your house. One day, you noticed that water hardly comes out of the faucet in the bathroom at the second floor of your house. Which of the following can you do to increase the exit speed of water in the second-floor bathroom?

I. Replace the water tank with one that has a larger capacity.
II. Replace the second-floor bathroom faucet's pipe with a larger diameter one.
III. Increase the height of the water tank above the ground.
IV. Install an electric water pump to increase the water pressure in the house.

A. I and IV only
B. II and IV only
C. II and III only
D. III and IV only

15. You are to construct a water tank with a horizontal exit pipe at the bottom. You want the water to exit the pipe at high speed when the tank is full. Which of the tank designs below should you consider?

A. B. C. D.



16. Which of the following machines is not an application of the lever principle?

A. wheelbarrow
B. pliers
C. ladder
D. pulley

17. Which example proves light is faster than sound?

A. We hear lightning before seeing thunder
B. We see lightning before hearing thunder
C. We see ripples in water after hearing a splash
D. We see ripples in water before hearing a splash

18. The tool shown below would most likely be used to:

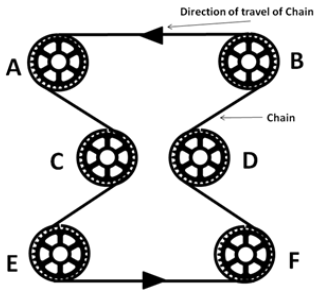
A. carve wood
B. drive nails
C. tighten bolts
D. weld metal

19. Which among the tool/s are used by electrician?

I. 
III. 
II. 
IV. 

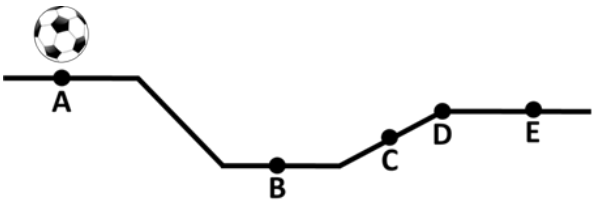
A. I and II
B. I, II and III
C. I, II and IV
D. I, II, III and IV

20. In the figure shown below, which gears are turning clockwise?



A. A, C and E
B. B, D and F
C. C and D
D. E and F

21. You are playing with a ball on an uneven surface as shown in the figure below. Assuming that the ball moves from point A to point D across the surface, at what point from the figure will your ball have a minimum gravitational potential energy?



A. Point A
B. Point B
C. Point C
D. Point D

22. You are in a resort enjoying your summer vacation in the pool. Curious as you are, you wanted to know the density of water in the pool. The owner told you that the pool has a 300-cubic meter capacity which is equivalent to 297,000 kg of water. What is the density of water inside the pool?

A. 1.01 m^3/kg
B. 2.02 m^3/kg
C. 990 kg/m^3
D. 1980 kg/m^3

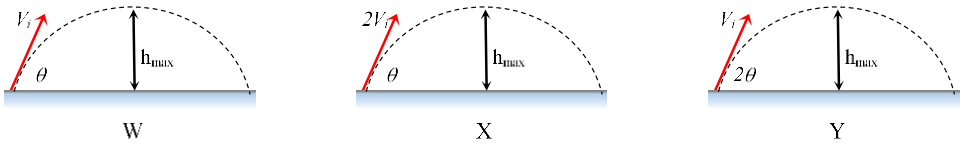
23. Mr. Havana found a large piece of wood drifting during the flood after the Typhoon Yolanda. Since he sees the wood as still useful, he plans to smoothen the surface using a hand tool. Which of the following tools can he use to smooth the piece of wood?

A. A wrench
B. A screwdriver
C. A plane
D. A hammer

24. A firetruck is sounding its horn while it's moving away from you to respond to a burning house. As you observe, the pitch of the horn's sound relative to its normal pitch is _____.

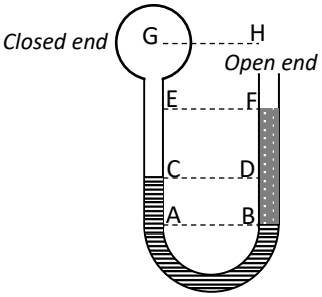
A. Higher
B. Lower
C. the same
D. higher or lower depending upon the exact frequency

25. In a projectile motion: for a given initial velocity V_i and angle θ which is less than 90°, determine the projectile that will reach the highest point (maximum height).



A. Projectile W
B. Projectile X
C. Projectile Y
D. Both Projectile X and Y

26. A U-tube manometer is closed one end and open on the other end which is exposed to the atmosphere. It contains oil, water and air with different levels as shown. From the given statement below, which of them are true about the pressure at the same level?



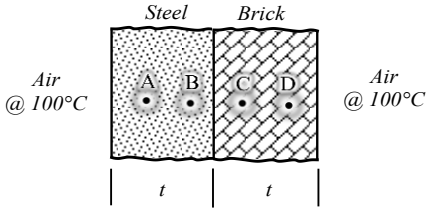
Oil
Water
Air

Statements:

I. $P_A = P_B$
II. $P_C = P_D$
III. $P_E = P_F$
IV. $P_G = P_H$

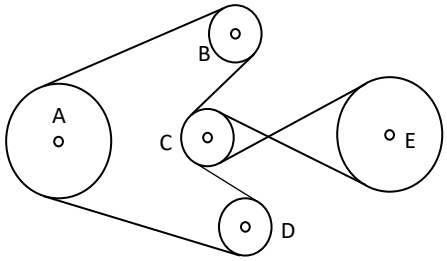
A. I only
B. II only
C. II and III
D. I and IV

27. Considering a steady state heat conduction across a plane composite wall composed of steel and brick. If both the brick and steel have the same thickness and the coefficient of thermal conductivity of steel is higher compared to that of the brick, which of the following points considered to be with the highest temperature given that the surrounding air on both sides is 100°C.



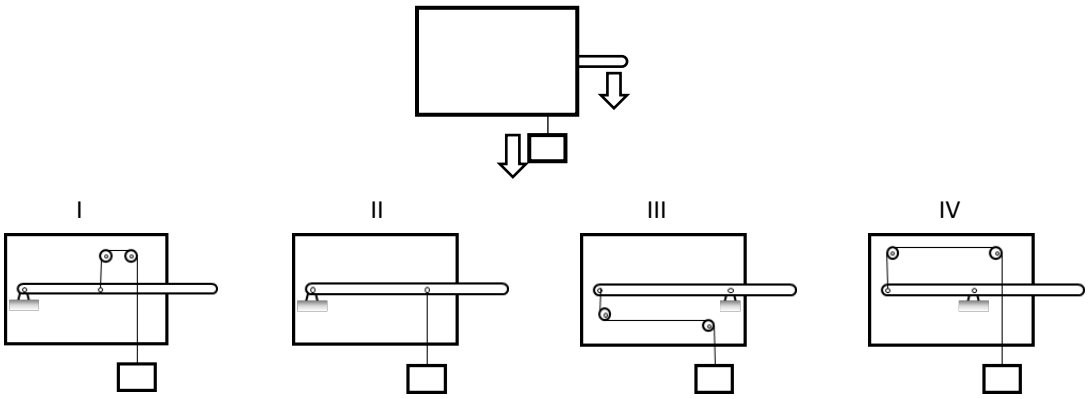
A. Point A
B. Point B
C. Point C
D. Point D

28. Pulleys A, B, C and D are linked together using a belt, while pulleys C and D are linked using a crossed belt. Pulleys A and E are of the same size, while pulleys B, C and D are of the same size and half of the bigger pulleys. What will be the rotation and speed of the pulley at E relative to the pulley at A if the pulley at A is rotating counter clockwise?



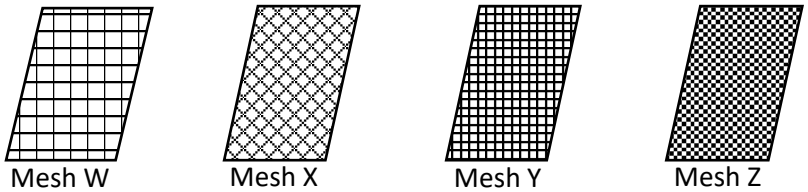
A. Clockwise and twice the speed of the pulley at A
B. Counter clockwise and twice the speed of the pulley at A
C. Clockwise and the same speed as pulley at A
D. Counter clockwise and the same speed as pulley at A

29. Which system will have a downward motion on the suspended block if the lever on the right is moved downward?



A. I and II only
B. II and IV only
C. I, II and III only
D. II and III only

30. In sieving wet sand, which process is the most efficient to separate various sizes of aggregates to course and fine granules of sand using different sieving opening or wire mesh with one mesh is over the other.



A. W – X – Y – Z
B. Z – Y – X – W
C. W – Z – Y – X
D. Z – X – Y – W

ANSWER KEY

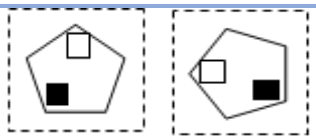
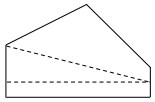
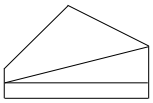
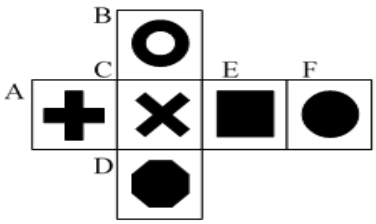
I. LOGICAL REASONING

VERBAL REASONING

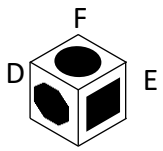
ITEM NO.	ANSWER	RATIONALIZATION
1	C	
2	A	
3	A	
4	A	
5	A	
6	C	
7	B	
8	C	
9	D	
10	D	

ANSWER KEY

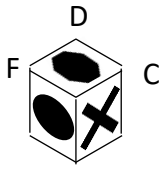
NON-VERBAL REASONING

ITEM NO.	ANSWER	RATIONALIZATION
1	C	Rotate Left 90◦ 
2	D	When the other options are spatially rotated, they are a mirror image of the target image.
3	D	Each diagram can be seen as a series of triangles around a horizontal axis. At each step, the right-hand triangle relocates to the beginning of the sequence causing a shift to the right.
4	D	All frames besides frame D are symmetrical, which means that they can be crossed somewhere by a straight line that will divide them into two similar parts (mirrored). There is no such option in frame D.
5	A	The back view can be converted into a front view by flipping and making the hidden lines visible:  *Back view*  *Possible Front view*
6	B	
7	C	
8	C	
9	C	
10	B	
11	D	 It is the original block turned once clockwise. The circle faces forward. Next, it is turned on its side so that the diamond moves from the top to the right side.
12	D	 The logic: Pairs of columns are reflections of one another.
13	A	The arrangement of the cube in a flat surface when the two pieces of cube puzzle is combined is:  For the view cube, possible combinations of the views are: ABC; ACD; BCE; CDE; BEF; DEF; ABF and ADF

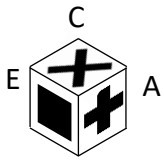
<table>
<tr>
<td></td>
<td></td>
<td>For the choices:

A. 

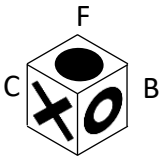
For sides D and F, the only possible third side is E or A. Therefore, it is a correct view cube

B. 

For sides D and F, the only possible third side is E or A. Therefore, it is a wrong view cube

C. 

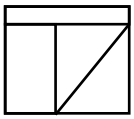
For sides E and C, the only possible third side is B or D. Therefore, it is a wrong view cube

D. 

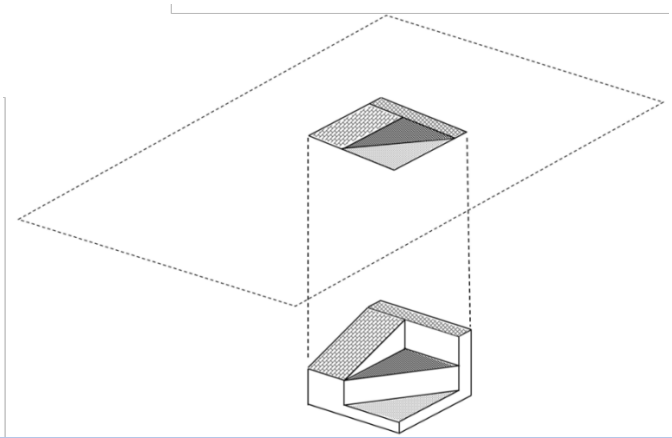
For sides B and F, the only possible third side is A or E. Therefore, it is a wrong view cube

Therefore, the answer is A.</td>
</tr>
<tr>
<td>14</td>
<td>B</td>
<td>The shaded parts are the surfaces that can be projected and be viewed on the top plane.

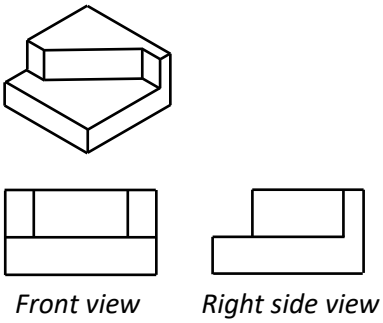
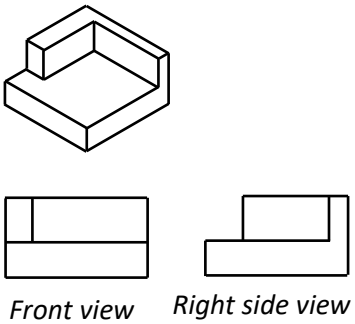
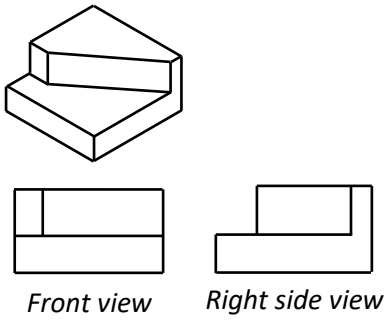
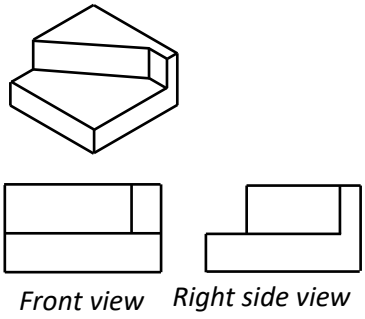
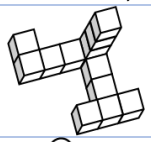
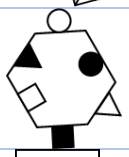
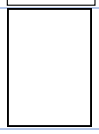
And the projected plane is the same as figure at letter B.

Therefore, the answer is B.

  </td>
</tr>
</table>

ANSWER KEY

15	A	A.  *Front view* *Right side view* B.  *Front view* *Right side view* C.  *Front view* *Right side view* D.  *Front view* *Right side view* Therefore, the answer is A.
16	B	
17	D	
18	D	
19	B	
20	D	

ANSWER KEY

II. POWER TEST

ENGLISH

ITEM NO.	ANSWER	RATIONALIZATION
1	B	The answer is "Roman's Math scores have improved". The verb phrase should be in the present perfect tense with the Auxiliary Verb in the plural form (have) to agree with the subject "scores." Roman's scores improved from 85% to 87%. The time reference is last quarter (some point in the past) and this quarter (some point in the present). In this context, the appropriate verb tense is Present Perfect which indicates an action that occurred over a prior time period and that is completed at the moment of speaking. This captures the progress of Roman's scores over time.
2	A	The answer is "A report on renewable energy was submitted by a group of students". The item requires a rephrasing of the stem which is in active voice to its passive form. To transform into passive, the object of the verb (report on renewable energy) must be the subject of the sentence. This condition is fulfilled by all the options; however, the verb form must also be accurate. The required verb is in the simple past passive form (was submitted) because the tense in the stem is simple past and the object turned subject (A report) is singular.
3	B	The answer is "would not have happened". This item requires the proper verb form in a Type 3 conditional sentence (untrue in the past). If the if-clause is in the past perfect (had been more careful), the result clause should use would have + past participle (would not have happened).
4	C	The answer is "Girls' bond over sharing secrets and boys' preference for doing activities together show gender differences when children socialize". To achieve an adequate paraphrase, these are some steps that can be considered: (1) locate the major idea units, (2) change the order of major idea units but maintain their logical connection, and (3) substitute synonyms for some words in the original. All options fulfill step (1) because both major idea units are mentioned: that there is gender difference in childhood socialization and that girls and boys have different preferences in establishing social connections. However, it is only Option C which fulfills all three steps to achieve an adequate paraphrase maintaining the logical connection indicated in the original sentence.
5	B	The answer is "Technology-mediated communication has changed how people use various media to build relationships". Options A, C, and D are the same in expressing "technology-mediated communication through various media" as one idea unit which changed "how people build relationships." Option B is different in this aspect because

		"use of various media" is clustered with "people" "how people use various media."
6	C	The answer is "Anyone is capable of leadership which is defined as influence". Option A is partly true about the passage. Option D is logical based on one's background knowledge. Option B is incorrect as the passage mentions that leadership is not about power and charisma. Option C provides a good gist of the passage which states how anyone can be a leader given that he/she can influence others.
7	A	The answer is Use "Moreover" to begin sentence 3 to improve coherence. The paragraph does not have any problem in content and unity. The inclusion of a cohesive device improves the logical connection of ideas in the paragraph. The spider's silk elasticity is an additional detail, thus the use of "Moreover."
8	C	The answer is "To conclude the paragraph". Sentence 8: The wise use of telescopes made us better understand our universe is a concluding sentence.
9	B	The answer is "Scientists used telescopes to learn about planets". Options C and D are specific details that do not capture the major idea about telescopes. Option A is an illogical statement since the scientists and not the telescopes who studied gravity and speed of light. Option B captures the main idea about telescopes being a useful tool in studying planets and space.
10	A	The answer is "Sentences 3 and 5". The item requires supporting details. Sentences 3 and 5 provide these because they are about specific important discoveries: moons orbit around Jupiter and the sun is the center of the universe. Sentences in Option B are main idea sentences. Options C and D combine less important ideas that do not directly support the main idea sentence: The use of telescopes led to important discoveries.
11	D	The answer is "comparison-contrast". The topic sentence indicates that the paragraph compares renewable energy and fossil fuels. The use of signal words including "more," "in contrast," and "while" are also clues that show the pattern of paragraph development. Examinees may choose option A since some of the supporting details express effects of renewable energy and fossil fuels to the environment. However, this is just one point of comparison used in the paragraph.
12	C	The answer is "The use of renewable energy benefits people and the environment". Options A and B are specific points in the paragraph, but Option C captures the main idea that should be emphasized to highlight the benefits of renewable energy.

ANSWER KEY

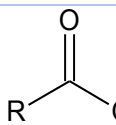
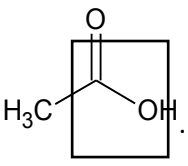
13	D	The answer is "Show a comparison of renewable energy and fossil fuels". The pattern of paragraph development is comparison and contrast, so it will make sense to also present the information in the infographic the same way. Options A will only feature certain specific details from the paragraph, while Options B and C are details not present in the paragraph.
14	A	"Varsity" is singular; the verb should be "wins"
15	A	"Ham and cheese" is taken as a pair and considered singular; verb should be "is"
16	C	"I" does not follow regular subject-verb agreement rules; it takes a plural verb form (like the singular form of "you"). The correct verb here should be "sing"
17	D	It should be recognized that this is an idiomatic expression item, i.e., a blessing in disguise = an apparent misfortune that eventually has good results.
18	D	This is a rephrasing item. Letter D retained the emphasis of confidence of the original statement in passing the test, and the cause-effect relationship is clear.
19	D	This is a logical connectors item. Yet is a coordinating conjunction which uses the "nevertheless" sense.
20	D	This is a vocabulary in context item. C and D get points, but "margin" is similar to "periphery" in social structure contexts (which is what the article is about), while flank is not.
21	D	This is a "predict a possible objection to a benefit" item. C gets less points than D because although rebellion seems bigger than scamming, rebellion could be justified and could hardly be staged on mobile phones (alone) while scamming is not, and it's disadvantage is always personal.
22	C	"3" is the most relevant purpose among the options as it really is the meat of the article (mobilizing people), Letter C is the best answer because "2" is the second most relevant purpose because it is about two types of mobilizing people.
23	D	This is a textual evidence item, and the best answer can be found in the article itself. The best answer is D.
24	C	
25	B	
26	C	
27	D	
28	D	
29	C	
30	D	
31	D	
32	B	
33	A	
34	A	
35	A	
36	D	
37	D	
38	A	"Eulogy" in the title already provides a clue in the poem's main idea. Also, the concept of death applies not only to people but to roaches as well. C and

		D get a point each because they support the main idea, while B does not get a point because it is too general, and it does not apply to the roaches.
39	B	This is a vocabulary in context item. A and B are similar in meaning, but "accolade" is not used to refer to the dead, while "tribute" is. C and D get zero points because they are entirely different concepts from eulogy.
40	B	This item determines the stand or tone of the writer in the article. A, B, and D get zero points because they are not apparent in the poem at all. B is the correct answer because the writer presents the idea of death matter-of-factly or dis-passionately.
41	D	This is a textual evidence item, and the best answer can be found in the poem itself. The best answer is D.
42	D	This is an "applying concepts to practical situations" item. A and C are acceptable answers, and they are both ideally organized. D is the best answer because it includes mostly the important parts of an email in an ideal order. B gets zero points because CC/BCC are not that necessary—one could always send the same email directly to those recipients.
43	C	This is a vocabulary in context item. C is the best answer because it is like the idea of eviction—an indefinite departure initiated by an external force. A and B are similar because they could be both voluntary actions. D is initiated by an external factor but only for a specific period.

ANSWER KEY

SCIENCE

ITEM NO.	ANSWER	RATIONALIZATION
1	A	Magnification is the product of the magnification of the eyepiece and the objective used. To compute for the magnification of the objective, you should divide the overall magnification with that of the eyepiece (100 / 20).
2	C	To photosynthesize, plants need light, water, and carbon dioxide. They do not need oxygen because oxygen is a by-product of photosynthesis.
3	B	Animals that live in tundra should have rich fat reserves that they need to nourish their bodies during their hibernation period. They also need a thick fur coat to insulate them from the extreme cold temperature in this biome.
4	B	
5	D	
6	A	
7	C	The fine adjustment knob is adjusted to sharpen the focus. The coarse adjustment knob is to adjust the distance between the objectives and the slide to look for the specimen. The eyepiece is where you view the image. The mirror serves as a light source.
8	A	Pag-asa is a cactus. Cacti can live in deserts because they have stores of water in their succulent stems and they have reduced leaf surface area to lessen water loss through transpiration.
9	C	According to the Kinetic Molecular Theory, the molecules move faster when the temperature is raised, thereby increasing their KEs. Hence, option C is false.
10	A	Refer to rules in chemical nomenclature. In general, the element should be properly represented by the appropriate chemical symbol in the Periodic Table. The cation's charge becomes the anion's subscript, while the anion's charge becomes the cation's subscript. The subscripts can be taken as a ratio and can be deduced to simpler forms. Only A follows these general rules.
11	A	All of the given choices, except C_3H_8 are ionic compounds since they are formed by the complete transfer of electrons from a metal to a non-metal. The covalent compound C_3H_8 is formed from sharing of electrons between two non-metals.
12	B	Copper is paramagnetic and can be recovered using a magnet. Water can be easily removed by filtration or decantation. Distillation is a process used to separate two miscible liquids, and not two solids. Hence, method B will separate the mixture most effectively.
13	D	The separation of the pigments from the solution can best be achieved via chromatography, since the basis of separation is polarity. Centrifugation would definitely not separate the pigments from the solution since they are both in liquid form. Distillation and evaporation may do, but not as effective as chromatography.
14	D	Sodium chloride, NaCl, or table salt, is a solid compound at room temperature. It is an ionic compound that conducts electricity when dissolved in water.
15	A	The best answer is letter A which is that of line segments A and D. It is because in a displacement versus time graph. A horizontal line segment represents no displacement. This means that the object, in this case the grab

		taxi is not moving. Graphs A and D are horizontal line segments representing no movement. Line segment B a graph with positive slope. This graph shows a constant speed moving away from the original position. Line segment B on the other hand represents a constant speed with the object returning to the original position. Ray E represents a changing speed, meaning that the graph is accelerating.
16	C	
17	A	
18	A	
19	B	
20	C	
21	B	Definition of Comet.
22	D	During a total solar eclipse, the moon is between the sun and the earth. If the earth is between the sun and the moon, it is a lunar eclipse. A and B are impossible since the moon rotates around the earth.
23	B	Sun moves east to west. If you face north, the sun will move from right to left.
24	A	Clastic sedimentary rocks are formed when pieces of pre-existing rocks are loosened by weathering and transported to other places where some sediments are trapped and hardened.
25	A	Decreasing the slope and water running smoothly slow down the mass movement of sediments. These are the factors in the formation of delta.
26	D	
27	D	
28	B	
29	A	
30	B	
31	A	Definition of an Asteroid.
32	A	Magnification is the product of the magnification of the eyepiece and the objective used. To compute for the magnification of the objective, you should divide the overall magnification with that of the eyepiece (100/10).
33	C	When fish need some salt to live, this means that they have evolved in a marine environment. Estuaries are brackish areas where saltwater meets the freshwater coming from mouth of rivers.
34	B	
35	C	Carboxylic acids have the functional group  . This is present in acetic acid as shown below  .
36	C	It has the balanced chemical equation with correct formula for the reactants and products.

37	D	It shows the correct sequence of steps in determining the empirical formula of the compound.
38	C	Follow Aufbau's Principle in writing the electronic configuration. If the element has a nuclear charge of +16, the element also has 16 electrons. Also, bear in mind that s can hold a maximum of 2 electrons, p can hold 6, d can hold 10 and f can hold 14. Hence, the electron configuration should be $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^4$, which is letter C.
39	C	Solve for the proton number (P), neutron number (N) and electron number (E), independently. For an atom of the notation ${}^{A}_{Z}X$, recall that the atomic number, Z, is equivalent to the proton number and electron number. The mass number A is equivalent to the sum of the proton number and neutron number. Hence, for ^{14}N Z = P = E = 7 The neutron number, N, is N = A – P = 14 – 7 = 7 Nitrogen has the same number of protons, neutrons and electrons.
40	D	Solve for the proton number (P), neutron number (N) and electron number (E), independently. For an atom of the notation ${}^{A}_{Z}X$, recall that the atomic number, Z, is equivalent to the proton number and electron number. The mass number A is equivalent to the sum of the proton number and neutron number. Hence, for ^{16}O Z = P = E = 8 The neutron number, N, is N = A – P = 16 – 8 = 8 Oxygen has the same number of protons, neutrons and electrons.
41	B	
42	B	The best answer is letter B. For maximum range to be attained, an angle for 45 degrees should be considered when firing a projectile with respect to the ground. It is derived from the equation for the range of a projectile given an initial velocity: $$R = \frac{v_o^2(\sin 2\theta)}{g}$$ where: R – range – horizontal displacement v_o - initial velocity θ – angle with respect to the horizontal g – gravitational acceleration constant (9.81 m/s^2) If 45 will be substituted in the equation, then the sin 2θ part of the equation will yield a maximum value of 1. This means that this becomes the maximum value of the angle to reach the farthest horizontal displacement from the original position.
43	D	The best Answer is letter D. We consider each of the options and tell which are not reasonable and which involves a change in speed. I. Fifteen minutes of break time spent eating in a table at the canteen.

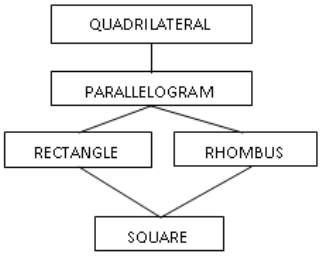
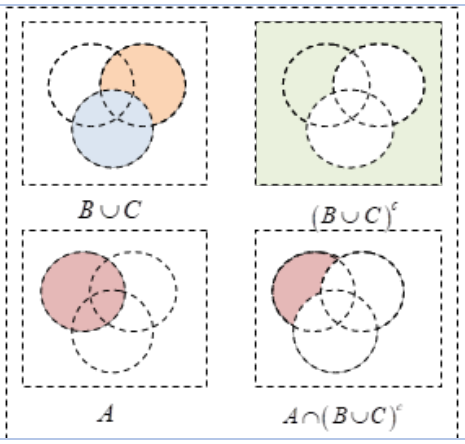
		This activity requires a change of speed as Ben may be moving and then stops or is initially not moving then walks. A time element of fifteen minutes for break is also reasonable. This means that this is not an option that we are looking for. II. Twenty minutes to walk to the nearby lecture room in Science. This activity is not reasonable. A nearby canteen will not take more than 20 minutes to go to. Spending more than 10 minutes will not be reasonable. This activity also involves possible variations in speed of Ben. This means that this fits the description in what is asked in the problem. III. Two hours to attend the Science lecture-laboratory. First, this activity does not involve a change in speed. Attending a lecture usually requires students to be seated and are therefore not moving. Spending two hours in a lecture is also acceptable. IV. Twenty-minute walk to a nearby canteen. Walking involves possible changes in speed. Spending twenty minutes to walk to a "nearby" canteen is also not reasonable. Canteens are usually near and does not require more than 10 minutes to go to. V. An hour to attend a lecture in Math. Attending an hour of lecture usually does not require a change in speed. It also usual that lecture sessions to be around an hour. This means that only options II and IV fit what is required by the item.
44	C	The best answer is letter C. The final displacement simply is determined by determining the distance of the object from its initial position to its final position. As can be seen in the graph, you only need to focus on graph 8 which shows that the object is 8 meters away from the initial position. This means that its displacement is 8 meters.
45	C	The best Answer is letter C. We consider each of the options and tell which are not reasonable and which involves a change in speed. I. Two hours bus nonstop trip from home to the church 70 m away. Spending more than 1 hour to cover 70 meters is <u>not reasonable.</u> A bus can travel at an acceptable rate of 80 km per hour and as slow as more or less than 20 km per hour. Even if the bus travels at 1 km per hour, the bus will surely cover the distance of 70 meters in less than an hour. II. An hour spent to attendance the mass. It is reasonable for a person to spend an hour stationary in the church. A usual church service covers an hour. III. One-minute walk to the market 1 km away from the church;

		It is impossible for a person to cover a kilometer by walking. Even if a person covers 2 meters per step, the person can only cover 120 meters in a minute. This means that the speed of the person needs some revisions. IV. Thirty minutes spent to buy goods from Aling Susan's grocery store in the market. Spending thirty minutes to buy goods is reasonable. This means that only options I and III are NOT reasonable and the options asked in this item. The option that refers to these is option C.
46	B	The best answer is B. A horizontal graph in a velocity versus time graph represents constant velocity. A slanted graph represents an accelerating object. If the slant has a positive slope, the acceleration is positive and if the slant has a negative slope, the acceleration is negative.
47	A	Sequence from oldest to youngest (bottom to top) 1. Siltstone P 2. Shale M 3. Limestone C 4. Sandstone L 5. Limestone D 6. Sandstone Q 7. Siltstone O
48	C	Absolute dating uses the isotopes present in a fossil to know the age of the fossil. Carbon dating is used for fossils that are organic and are up to 10,000 years old. Potassium-Argon is used for older fossils.
49	C	
50	B	
51	B	All living organisms make an impact on soil development. Humus is formed in the upper layer of the soil, which is composed of dirt, litter, water and air. Soil does not form overnight. A variety of micro-organisms in the soil help decompose living materials, making the soil rich in nutrients. Increasing the amount of living organism in soil increases the biological activity. A, C and D. Slope and air pressure have no impact on soil development, decreasing the amount of rainfall inhibits the development of the soil.
52	D	There are two types of energy source – renewable and non-renewable. Renewable energy source can be replenished right away, while non-renewable can be replenished for a longer period. Knowing these definitions, one must know how to conserve energy. Each one should know their role/s in utilizing energy.
53	C	
54	C	Earth's layers from outside-in: crust, mantle, outer core, inner core. With boundaries/discontinuities: crust, Moho, mantle, Gutenberg, outer core, Lehmann, inner core. Boiled egg: shell, albumen, yolk (core).
55	D	Silt can be described as loosely packed suspended sediments. It is deposited at the bottom of water, while mud is a mixture of water and combination of soil, silt, and clay. Earthquake occur strongly when Earth surface is geologically water-saturated like silt and mud. It can cause buildings to tilt,

		underground pipes to break, infrastructures to be displaced and many more during earthquake.
56	D	Earth's solid core is composed of iron with lesser amounts of solid nickel. Layers 1 – 3 contains the following: ▪ 3 – liquid outer core is composed of iron mixed with nickel and trace amounts of lighter elements. ▪ 2 – lower mantle rich in iron and magnesium ▪ 1 – lower part of the crust is composed mainly of basalt and granite
57	B	Convection currents along the asthenosphere happens when warm air is less dense than colder air, and so warm air rises, as it rises it expands and cools, and then begins to fall. The heat is transferred to the surface where less dense magma separates the plates at the divergent zone (the Mid-Atlantic ridge. When the plates move away from the spreading centers, they cool, and the higher density basalt rocks that make up ocean crust formed at the ocean trenches/subduction zones. The crust is recycled back into the asthenosphere. A and C are other mechanisms of heat transfer not shown in the diagram D is called Incoming Solar Radiation.
58	B	The answer B corresponds to the permeability (from the greatest permeable to the least permeable) characteristic of the material
59	D	Convection currents happens along the asthenosphere or on the upper mantle happens when warm air is less dense than colder air, and so warm air rises, as it rises it expands and cools, and then begins to fall.
60	A	Oldest to youngest = bottom to top sequence.

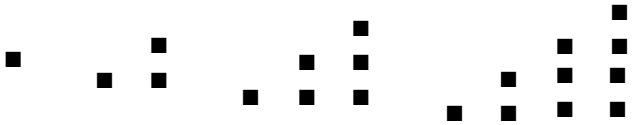
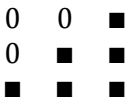
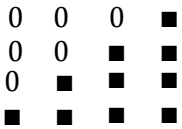
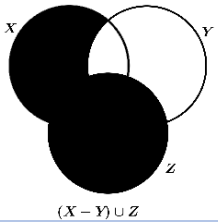
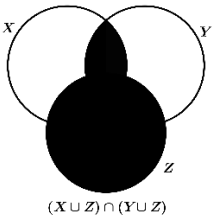
ANSWER KEY

MATHEMATICS

ITEM NO.	ANSWER	RATIONALIZATION
1	A	Each element in the domain (real numbers) of the function defined by corresponds to a unique image (real numbers). This can further be verified by sketching the graph of f(x) and check that it is a one-to-one function by using the horizontal line test. Horizontal Line Test: A function is one-to-one if and only if each horizontal line intersects the graph of the function in at most one point.
2	C	The diagram below satisfies the correct set of true statements. 
3	D	"If two sides of a quadrilateral are parallel and congruent, then the quadrilateral is a parallelogram." P: Two sides of a quadrilateral are parallel. Q: Two sides of a quadrilateral are congruent. R: The quadrilateral is a parallelogram. $\overbrace{\textit{If two sides of a quadrilateral are parallel and congruent}}^{(P\wedge Q)}, \rightarrow \textit{then the quadrilateral is a } \overbrace{\textit{parallelogram}}^{R}.$
4	B	$\sin\beta = -\frac{3}{5} \qquad \cos\beta = -\frac{4}{5}$ $\cos^2\beta - \sin^2\beta = \left(-\frac{4}{5}\right)^2 - \left(-\frac{3}{5}\right)^2$ $= \frac{16}{25} - \frac{9}{25} = \frac{7}{25}$
5	A	

6	D	The sequence defined in the problem is 1, 3, 5, … Let $S_n = 225$. The formula in determining the number of rows is $S_n = \frac{n}{2}\left[2a_1 + (n-1)d\right]$. $225 = \frac{n}{2}\left[2(1) + (n-1)(2)\right]$ $450 = n(2 + 2n - 2)$ $450 = 2n^2$ $225 = n^2$ $15 = n$
7	C	$72 : P = 3 : 2$ $3P = 144$ $P = 48$ $protesters : policemen = 12 : 1$ $protesters : 48 = 12 : 1$ $protesters = 48(12)$ $protesters = 576$
8	D	$n\Pr = 6P6 = 6! = 720$
9	C	There are $\binom{10}{2}$ = 45 ways of drawing 2 balls from the box of 10 balls. To get an even sum, the two balls must have labels that are both odd. Among the ten prime numbers less than 30, 9 of them are odd (and the other is 2, which is even). This means that there are $\binom{9}{2}$ = 36 ways of drawing 2 balls with even sum. Therefore, the required probability *is* $\frac{36}{45} = \frac{4}{5}$.
10	A	We check the ratio of two consecutive terms in each choice. A. $\frac{abrs}{ab} = rs$, $\frac{abr^2s^2}{abrs} = rs$, $\frac{abr^3s^3}{abr^2s^2} = rs$, …… *a geometric sequence* B. $\frac{abr}{ab} = r$, $\frac{abs}{abr} = \frac{s}{r} = 1$, $\frac{abr^2}{abs} = \frac{r^2}{s} = r$, $\frac{abs^2}{abr^2} = \frac{s^2}{r^2} = 1$, …*NOT a geometric sequence always* C. $\frac{a+b+r+s}{a+b} \neq \frac{a+b+r^2+s^2}{a+b+r+s}$ ..... *NOT a geometric sequence always* D. $\frac{a-b+r-s}{a-b} \neq \frac{a-b+r^2-s^2}{a-b+r-s}$ ..... *NOT a geometric sequence always*
11	D	From the information above, we obtain the following system of equations: $\begin{cases} a + b = 2 \\ 3a - 2b = 16 \end{cases}$ The solution of the system is $\boldsymbol{a = 4, b = -2}$.
12	B	Given: $P = 80{,}000, r = 0.035, t = 1, I = interest = ?$ $I = Prt = (80{,}000)(0.035)(1) = 2{,}800$
13	C	Let x = the amount allotted for the internet café and y = the amount allotted for the photo booth. From the information above, we obtain the system $\begin{cases} x + y = 120{,}000 \\ 0.05x + 0.04y = 5{,}800 \end{cases}$ where solution is $x = 80{,}000$ and $y = 40{,}000$.
14	B	
15	D	
16	D	
17	C	
18	B	
19	D	
20	C	

ANSWER KEY

21	A	
22	D	
23	D	By the triangle inequality theorem, we have the following inequalities for the sides • 13+17>z, so 30>z • z+13>17, so z>4 • z+17>13, so z>-4 From the inequalities, the only possible values for z are between 4 and 30. So 29 is a possible value of the z.
24	D	I is true because 55 is the 10th triangular number. II is true. The numbers can be represented as the following figures  and so on Observe that from each figure, you obtain the triangular number of by adding the first n numbers. Hence $$t_n = 1 + 2 + 3 + \cdots + n = \frac{n(n+1)}{2}$$ III is also true. Observe that 1+3=4  3+6=9  6+10=16  And so on…..
25	C	We can check each equality using Venn diagram. Among the three choices, the left-hand-side and right-hand-side sets of choice C are represented by different regions in the Venn diagram, as shown separately below, and so the sets are not equal.  $(X - Y) \cup Z$  $(X \cup Z) \cap (Y \cup Z)$
26	B	
27	C	
28	B	
29	C	
30	D	
31	A	
32	B	
33	A	
34	B	

35	A	$f(x)=\sqrt{x^2-1}$ $x^2-1\geq 0$ $(x-1)(x+1)\geq 0$ | | x < -1 | -1 < x < 1 | x > 1 | | x - 1 | - | - | + | | x + 1 | - | + | + | | | + | - | + | From the table above (consider it as an imaginary number line), for any values less than or equal to – 1 and greater than or equal to1 f(x) is non-negative. Thus, the solution is denoted by $(-\infty,-1]\cup[1,+\infty)$.
36	A	"If the diagonals of a quadrilateral bisect each other and they are perpendicular, then the quadrilateral is a rhombus." P: The diagonals of a quadrilateral bisect each other. Q: The diagonals of a quadrilateral are perpendicular. R: The quadrilateral is a rhombus.
37	A	The sequence defined in the problem is 3, 5, 7, … Let $S_n=120$. The formula in determining the number of rows is $S_n=\frac{n}{2}\left[2a_1+(n-1)d\right]$. $120=\frac{n}{2}\left[2(3)+(n-1)(2)\right]$ $240=n(6+2n-2)$ $240=2n^2+4n$ $2n^2+4n-240=0$ $n^2+2n-120=0$ $(n-10)(n+12)=0$ $n=10$
38	A	$n\Pr=10P4=5040$
39	C	From the information above, we obtain the following system of equations: $\begin{cases} a+b=-3 \\ -a+2b=18 \end{cases}$ The solution of the system is $a=-8, b=5$.
40	B	Let x = grams of nuts and y = grams of green peas. From the information above, we obtain the system $\begin{cases} x+y=1{,}000 \\ 0.05x+0.08y=62 \end{cases}$ whose solution is $x=600$ and $y=400$.

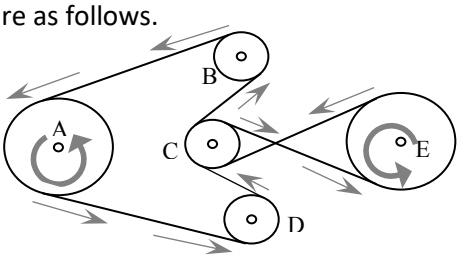
ANSWER KEY

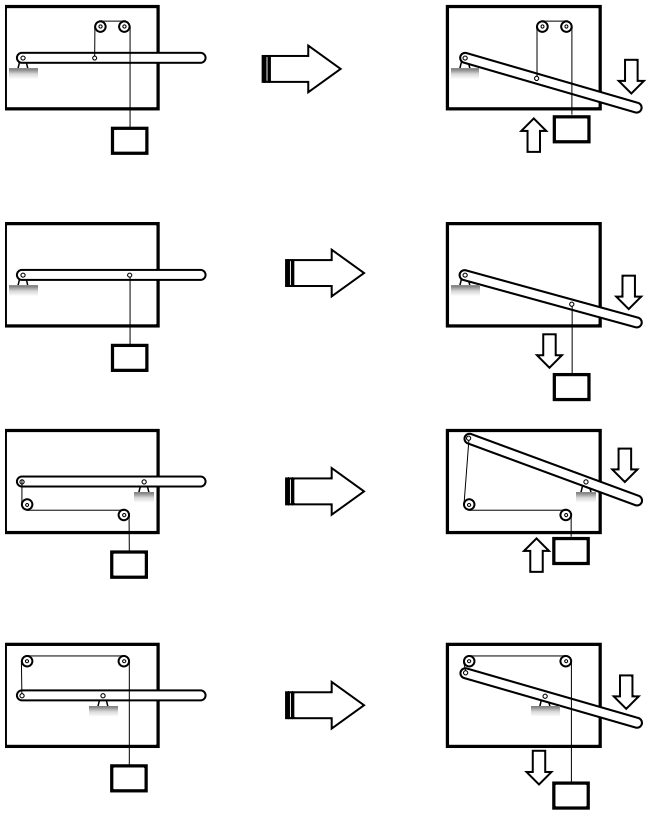
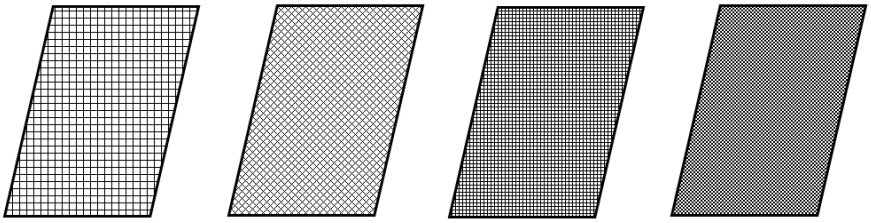
MECHANICAL-TECHNICAL

ITEM NO.	ANSWER	RATIONALIZATION
1	B	The direction of force exerted by the truck on the crate would be the same as the direction of the truck's motion.
2	D	Sound travels fastest through solids because the particles are closest together. It travels less quickly in gases because the particles are further apart.
3	B	5 μA(10 secs) = 5 x 10^{-5} coulombs
4	C	Changing gears on a ten-speed bicycle is a good example of using different size gears to change speed.
5	B	The picture shown is that of a socket wrench. From the choices given, a hex-head bolt which is tightened and loosened by a socket wrench is more relative.
6	A	Gear C is 4 times the diameter of gear A. Since the gears are all connected by a chain, the tip velocity of all the gears must be the same; otherwise, the chain would come off the gears. Therefore, if the tip velocity is to be the same for all gears and gear C is 4 times larger than gear A, then gear C must be turning 4 times slower than gear A. Twenty RPM divided by 4 equals 5 RPM.
7	A	Gravitational potential energy depends upon height (PE=m*g*h). A. Since point A is located at a point higher than point B, the potential energy at A is greater than the potential energy at B.
8	C	
9	C	Resonance happens when one object vibrating at the same natural frequency of a second object forces that second object into vibrational motion.
10	B	In a projectile motion, the reach is defined by the equation: $x = V_i (\cos\theta)\, t$; whereas the time of flight is defined by the equation: $t = 2V_i (\sin\theta) / g$. Where V_i is the initial velocity, the angle θ is the initial angle of projectile and g is the gravitational constant. Simplifying $x = V_i (\cos\theta) * 2V_i (\sin\theta) / g$ Since $2 (\cos\theta) (\sin\theta) = \sin 2\theta$ ----- double angle trigonometric identity Therefore: $x = V_i^2 (\sin 2\theta) / g$ For angle θ less than 45° the value of $(\sin 2\theta)$ is increasing as you increase the value of the angle. But for angle θ is greater than 45° but less than 60° the value of $(\sin 2\theta)$ is decreasing. For initial velocity V_i: the range x is increasing as it is the square of the initial velocity. The farthest distance is projectile X because the initial velocity is twice the value of the other even though the angle remains the same.
11	A	The bigger the driving wheel (rear wheel) the farther the distance it can travel with one rotation of the pedal because the circumference is larger compared to a smaller driving wheel, regardless of the size of the front wheel since it is only freewheeling.

		There are two bicycles with bigger driving wheel (bicycles W and Z), therefore the correct answer is A.
12	B	In Torricelli's Theorem, the velocity of a discharging fluid on a container is defined by the equation v = $\sqrt{2}$gh, where g is the gravitational constant and h is the height fluid or the vertical distance between the fluid surface and the point of discharge. Therefore, the lower the location of the holes, the higher the discharge velocity of fluid. Then the possible situation is B.
13	A	The material with higher thermal conductivity will have the highest temperature on the top surface given that all blocks are introduced to the same amount of heat from the burning wood. From the four materials, copper has the highest thermal conductivity, since it is being used as a heating element in most of the devices that produces heat such as flat iron, electric stove and water heater. Whereas brick has the lowest thermal conductivity among the four materials. Since it is being used to dissipate heat in furnaces or fireplaces. Aluminum has a higher thermal conductivity compared to steel. Therefore, the answer is A.
14	D	
15	B	
16	C	
17	B	Seeing lightning before hearing thunder shows us the light travels faster than sound.
18	A	This tool (chisel) carves wood. HAMMERS are used to drive nails; WELDERS or TORCHES are used to weld metal; WRENCHES are used to tighten bolts.
19	B	Choice IV is a picture of a carpenter's level which is used to determine whether a structure is built level to the ground while choices I, II and III are all common electrician tools. I. Wire Stripper II. Multimeter III. Flat-blade screwdriver
20	C	Gear C and D are turning clockwise. The other gears are turning counterclockwise. It helps to follow the direction of the chain, which is connected to all of the gears.
21	B	Gravitational potential energy depends upon height (PE=m*g*h). The PE is a minimum when the height is a minimum. Position B is the lowest position in the figure.
22	C	Using the formula for density $\rho = \frac{m}{V}$, with appropriate units of representation.
23	C	As defined, a plane is a metal tool with a handle and an adjustable blade, used to shave off thin strips of wood for smoothing or leveling.
24	B	The tendency to increase or decrease the wavelength of the sound due to the motion of the source is called the Doppler effect. Hence, when the Fire truck is coming toward you, the wavelength is decreased, and the pitch is above the pitch when the source is at rest. When the truck passes and is moving away from you, the opposite holds true. The

		wavelength is increased, and the pitch is decreased below the value when the source is at rest. The result is the familiar change of pitch from high to low as the Fire truck passes.
25	B	In a projectile motion, the reach is defined by the equation: $h_{max} = [V_i (\sin \theta)]^2 / 2g$; Where V_i is the initial velocity, the angle θ is the initial angle of projectile and g is the gravitational constant. Simplifying $h_{max} = V_i^2 (\sin \theta)^2 / 2g$ For angle θ less than 90° the value of $(\sin \theta)^2$ is increasing as you increase the value of the angle. For initial velocity V_i: the maximum height is increasing as it is the square of the initial velocity. The highest point is reached by projectile X because the initial velocity is twice the value compared to other projectiles even though the angle remains the same.
26	A	P_H = pressure of the atmosphere or P_{ATM}, since it is exposed to the atmosphere P_F = pressure of the atmosphere or P_{ATM}, since it is also exposed to the atmosphere $P_D = P_F$ + Pressure due to the weight of the oil = $P_{ATM} + \gamma_{oil} h_{oil(D-F)}$; where γ_{oil} is the specific weight of oil and $h_{oil(D-F)}$ is the height of oil from points D to F $P_B = P_F$ + Pressure due to the weight of the oil = $P_{ATM} + \gamma_{oil} h_{oil(B-F)}$; where γ_{oil} is the specific weight of oil and $h_{oil(B-F)}$ is the height of oil from points B to F $P_{BOTTOM} = P_B$ + Pressure due to the weight of the water = $P_B + \gamma_{water} h_{water(Bottom-B)} = P_{ATM} + \gamma_{oil} h_{oil(B-F)} + \gamma_{water} h_{water(Bottom-B)}$; where γ_{water} is the specific weight of water and $h_{water(Bottom-B)}$ is the height of water from bottom to point B $P_A = P_{BOTTOM}$ – Pressure due to the weight of the water = $P_{BOTTOM} - \gamma_{water} h_{water(Bottom-A)}$ $P_A = P_{ATM} + \gamma_{oil} h_{oil(B-F)} + \gamma_{water} h_{water(Bottom-B)} - \gamma_{water} h_{water(Bottom-A)}$; where γ_{water} is the specific weight of water and $h_{water(Bottom-A)}$ is the height of water from bottom to point A since $h_{water(Bottom-A)} = h_{water(Bottom-B)}$ therefore: $P_A = P_{ATM} + \gamma_{oil} h_{oil(B-F)}$ $P_C = P_A$ – Pressure due to the weight of the water = $P_A - \gamma_{water} h_{water(A-C)} = P_{ATM} + \gamma_{oil} h_{oil(B-F)} - \gamma_{water} h_{water(A-C)}$; where γ_{water} is the specific weight of water and $h_{water(A-C)}$ is the height of water from points A to C $P_E = P_C$ – Pressure due to the weight of the air = $P_C - \gamma_{air} h_{air(C-E)} = P_{ATM} + \gamma_{oil} h_{oil(B-F)} - \gamma_{water} h_{water(A-C)} - \gamma_{air} h_{air(C-E)}$; where γ_{air} is the specific weight of air and $h_{air(C-E)}$ is the height of air from points C to E $P_G = P_C$ – Pressure due to the weight of the air = $P_C - \gamma_{air} h_{air(C-G)} = P_{ATM} + \gamma_{oil} h_{oil(B-F)} - \gamma_{water} h_{water(A-C)} - \gamma_{air} h_{air(C-G)}$;

		where γ_{air} is the specific weight of air and $h_{air(C-G)}$ is the height of air from points C to G Therefore, the only true statement is $P_A = P_B$ and the answer is A
27	A	In conduction of heat, the point closer to the thermal source has the higher temperature. Since the source of heat is air at 100°C on both sides exposing the outer surface of the two materials, therefore points A and D are the possible points that have higher temperature compared to points B and C. Point A is on the steel side that has a higher thermal conductivity compared to brick. That will give us point A with the highest temperature compared to the other points.
28	D	The rotation of pulley at A is counterclockwise. The movements of the belts are as follows.  Then the rotation of the pulley at E is also counterclockwise. Regarding the speed of pulley at E relative to pulley at A: First, we relate the speed of pulley at C relative to pulley at A. Since pulley at C is half the size of the pulley at A, then the speed of the pulley at C is twice the speed relative to pulley at A. $Speed_C = 2\ Speed_A$ Relating pulley at E relative to pulley at C, since the pulley at E is twice the size of the pulley at C, then the speed of the pulley at E is half the speed relative to pulley at C. $Speed_E = ½\ Speed_C$ Hence, $Speed_E = ½\ (2\ Speed_A)$ $Speed_E = Speed_A$ Therefore, the answer is D.

29	B *B*	 Therefore, the answer is B.
30	A	Given different sizes of sand grains (from gravels or rocks to the finest sand); A is big rocks, B is small rocks, C is course sand, D is fine sand, and E is finest sand. For the following wire mesh to sieve granules of sand: below are the list of sizes than can pass through the mesh.  Mesh W B, C, D and E Mesh X C, D and E Mesh Y D and E Mesh Z E only A. W – X – Y – Z Mesh W will separate A and the rest will pass through to the next stage of sieving. On the next stage, mesh X will separate B and the rest will pass through to the next stage. Next is mesh Y will separate C the rest will pass through to the last stage of sieving. Lastly, mesh Z will separate D and E will be the final output of the filtering. B. Z – Y – X – W

		Mesh Z will only filter E and the rest will stay at the top of the mesh. In which the that sand compile on the top of mesh Z cannot proceed to the next stage of sieving that results to only finest sand can be separated. C. W – Z – Y – X Mesh W will separate A and the rest will pass through to the next stage of sieving. On the next stage, Mesh Z will only filter E and the rest will stay at the top of the mesh. In which the that sand compile on the top of mesh Z cannot proceed to the next stage of sieving that results to rocks and finest sand are separated from the other granules. D. Z – X – Y – W Mesh Z will only filter E and the rest will stay at the top of the mesh. In which the that sand compile on the top of mesh Z cannot proceed to the next stage of sieving that results to only finest sand can be separated. Therefore, the answer is A.