



Polytechnic University of the Philippines

**ASSOCIATION OF DOST SCHOLARS**

# **JUNIOR LEVEL SCIENCE SCHOLARSHIPS (JLSS) SAMPLE TEST**

Department of Science and Technology – Science Education Institute (DOST-SEI)

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## **NOTE**

This was a project by the Polytechnic University of the Philippines – Association of DOST Scholars (PUP – ADS) in 2020.

This is not the actual JLSS examination content and is not affiliated with the DOST-SEI. The reviewer was made by the volunteers in the organization.

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# ABOUT THE JLSS EXAMINATION

This is based on the primer by the DOST-SEI. Primer Link: [jlssprimer.pdf \(dost.gov.ph\)](http://jlssprimer.pdf(dost.gov.ph))

The examination is multiple-choice consisting of two (2) parts: Logical Reasoning Test and Power Test, with several sub-parts. It will be taken for around four (4) hours which consist of the reading of instructions, filling out forms, and actual testing. If a part is finished before the allocated time, it is not allowed to proceed to the next part. The time can be used to review the answers for that particular section. The examiners will not be allowed to leave the room once the examination begins except to the comfort room, when necessary.

The logical reasoning part will be taken by all the examiners. It is composed of three (3) sub-parts:

1. Spatial Reasoning
2. Mechanical Reasoning
3. Verbal Reasoning

On the other hand, the power test part will vary depending on the program and specialization. It is composed of four (4) to five (5) sub-parts.

Applicants Enrolled in	Sub-Tests
Engineering	Engineering, Mathematics, English, Teaching Aptitude
Science	Science, Mathematics, English, Teaching Aptitude
Mathematics	Science, Mathematics, English, Teaching Aptitude
ICT	ICT, Science, Mathematics, English, Teaching Aptitude

The following topics may be reviewed for the JLSS Examination:

## 1. Science

- a. Biology:** Cell/Cell Cycle/Cell Transport System; Energy Transformation; Organismal Biology; Genetics; Evolution
- b. Chemistry:** Matter; Atomic Structure; Molecules; Acids and Bases; Chemical Reactions; Solubility; Stoichiometry; Thermodynamics; Quantum Theory; Periodic Table; Chemical Bonding

- c. **Physics:** Graphical Analysis; Motion; Friction; Energy; Momentum; Gravitational Force; Kepler's Law; Density; Fluids; Waves; Sounds; Ohm's Law; Mirror Optics; Capacitors; Propagation of Light; Snell's Law
  - d. **Earth Science:** Rocks; Minerals; Continental Drift Theory; Volcanos; Rock Deformation; Earthquakes; Soil Formation and Erosion; Water Cycle; Earth/Earth History; Philippine Geology
  - e. **Environmental Science:** Natural Environment; Natural Resources; Human Impact on the Environment; Emerging Threats and Environmental Management
2. **Engineering:** Physics; Chemistry; Solid Mensuration; Differential and Pre-Calculus
3. **Mathematics**
- a. **Algebra:** System of Equations; Functions; Inequalities; Sequences; Expo-log Functions
  - b. **Analytic Geometry:** Distance Formula; Parabola\* and Ellipse\*
  - c. **Probability:** Counting; Simple Events; Compound Events
  - d. **Trigonometry\*:** Angle of Elevation or Depression; Graph of Functions
  - e. **Calculus\*:** Limits; Derivatives; Integrals
4. **Information and Communications Technology (ICT):** Number Systems; Logic; Basic Programming; Algorithmic Steps; Combinatorics: Data Storage; Flow Charting
5. **English:** Grammar and Syntax; Vocabulary; Reading Comprehension; Linguistic Competence

\*Additional Coverage for Mathematics Majors

# CONTENT

This sample test contains three (3) parts: Logical Reasoning, Power Test A, and B. Also, the links provided below can be used to answer the exam.

	YouTube Link	Answer Sheet Link
<b>Part 1. Logical Reasoning</b>	<a href="https://bit.ly/3PFbndJ">https://bit.ly/3PFbndJ</a>	<a href="https://bit.ly/3QXe6jt">https://bit.ly/3QXe6jt</a>
<b>Part 2.A. Power Test</b>		
English	<a href="https://bit.ly/3QFDhaJ">https://bit.ly/3QFDhaJ</a>	<a href="https://bit.ly/3QGKIUi">https://bit.ly/3QGKIUi</a>
Mathematics	<a href="https://bit.ly/3K7YHKY">https://bit.ly/3K7YHKY</a>	<a href="https://bit.ly/3wjde0R">https://bit.ly/3wjde0R</a>
Teaching Aptitude	<a href="https://bit.ly/3pylQwN">https://bit.ly/3pylQwN</a>	<a href="https://bit.ly/3T3oJTL">https://bit.ly/3T3oJTL</a>
<b>Part 2.B. Power Test - Specialization</b>		
Science	<a href="https://bit.ly/3caFaNy">https://bit.ly/3caFaNy</a>	<a href="https://bit.ly/3ABL1F3">https://bit.ly/3ABL1F3</a>
Engineering	<a href="https://bit.ly/3T7yOil">https://bit.ly/3T7yOil</a>	<a href="https://bit.ly/3KaH90W">https://bit.ly/3KaH90W</a>
Information and Communications	<a href="https://bit.ly/3TihuaX">https://bit.ly/3TihuaX</a>	<a href="https://bit.ly/3Kcf49i">https://bit.ly/3Kcf49i</a>
Technology		

# **JLSS SAMPLE EXAMINATION – PART 1**

## **LOGICAL REASONING**

It consists of three (3) sub-parts: Spatial, Mechanical, and Verbal Reasoning.

- Number of Items: 45

## I. SPATIAL REASONING

**Instruction.** Please encircle the most appropriate answer.

For items 1-5, determine the number of blocks in the figures.

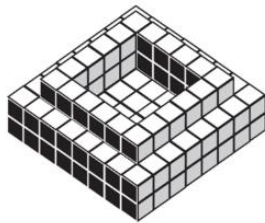


Figure 1

1. How many blocks are present in Figure 1?

- a. 120
- b. 130
- c. 132
- d. 142

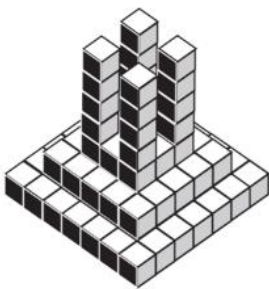


Figure 2

2. How many blocks are present in Figure 2?

- a. 100
- b. 99
- c. 98
- d. 97

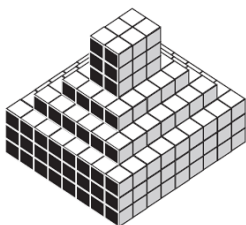


Figure 3

3. How many blocks are present in Figure 3?

- a. 300
- b. 296
- c. 294
- d. 297

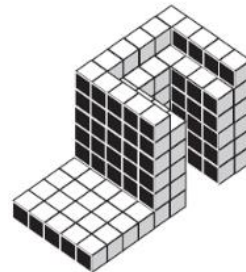


Figure 4

4. How many blocks are present in Figure 4?

- a. 150
- b. 152
- c. 153
- d. 154

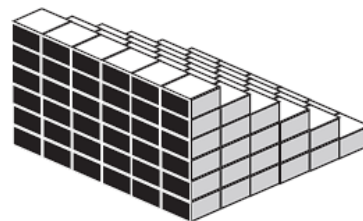


Figure 5

5. How many blocks are present in Figure 5?

- a. 126
- b. 128
- c. 132
- d. 124

For items 6-10, determine the rotated form of the given figure.

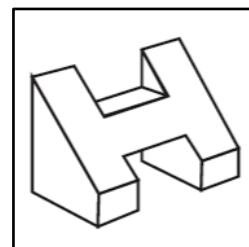


Figure 6

6. What is the rotated form of Figure 6?

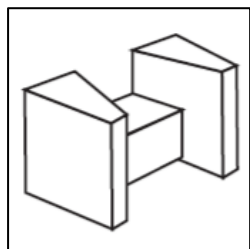
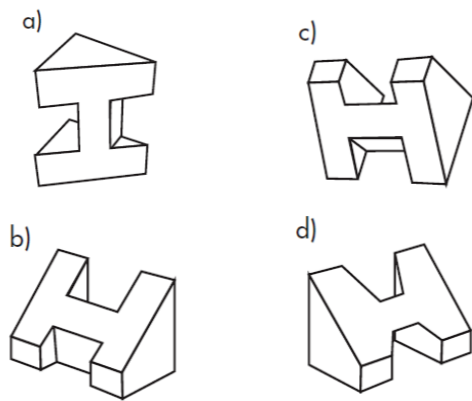


Figure 7

7. What is the rotated form of Figure 7?

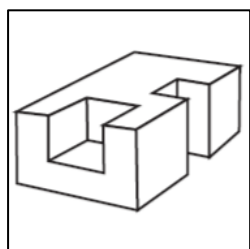
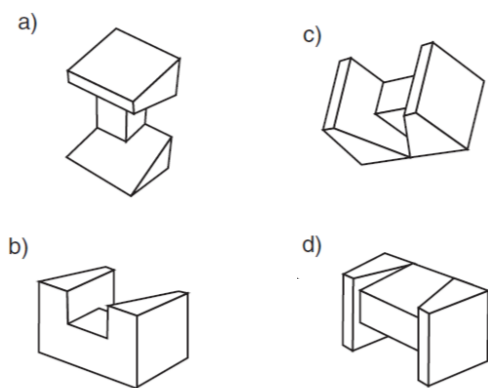


Figure 8

8. What is the rotated form of Figure 8?

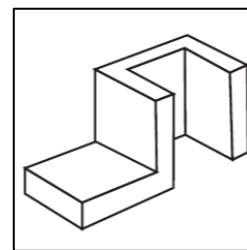
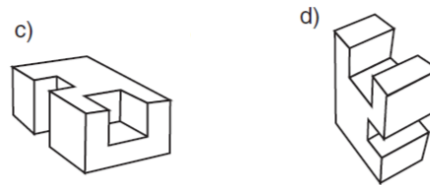
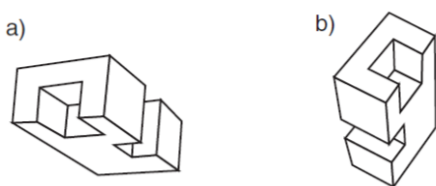


Figure 9

9. What is the rotated form of Figure 9?

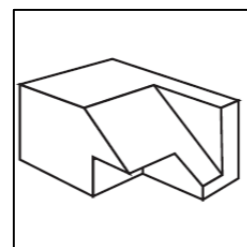
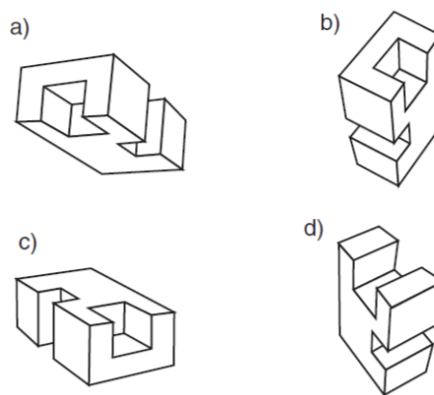
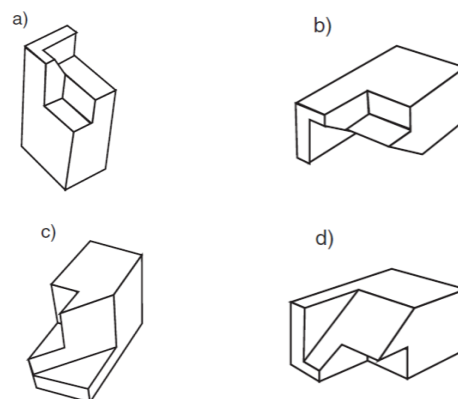


Figure 10

10. What is the rotated form of Figure 10?





For items 11-15, choose the folded three-dimensional shape that represents the figure.

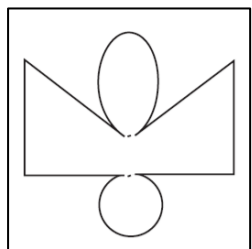


Figure 11

11. What best represents the folded Figure 11?

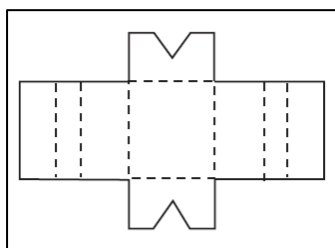
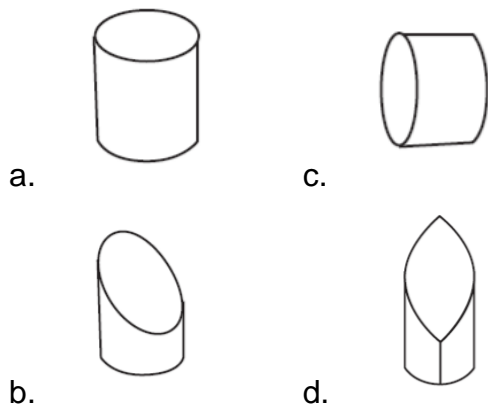


Figure 12

12. What best represents the folded Figure 12?

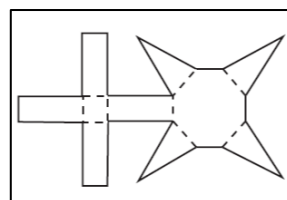
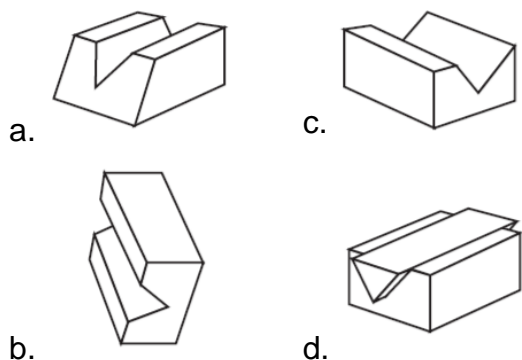


Figure 13

13. What best represents the folded Figure 13?

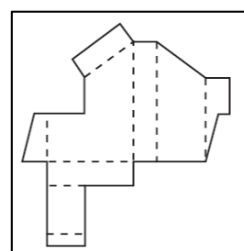
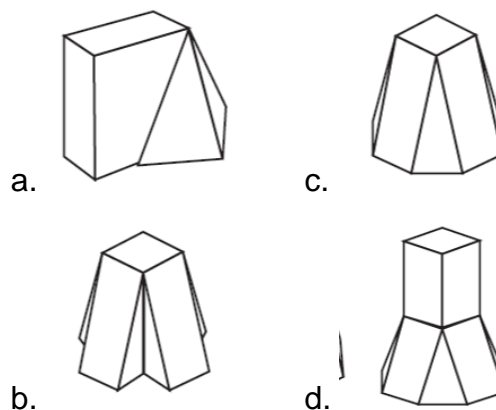
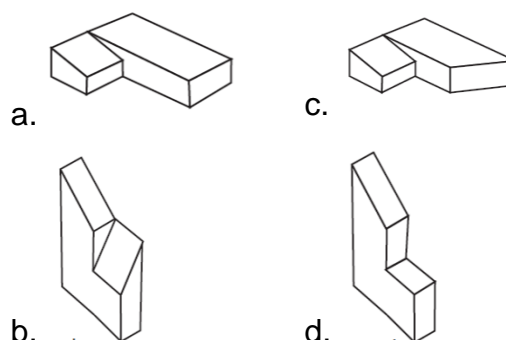


Figure 14

14. What best represents the folded Figure 14?



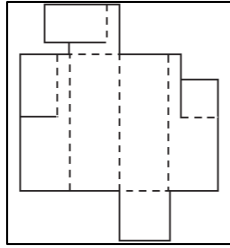
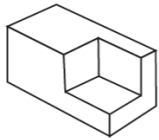
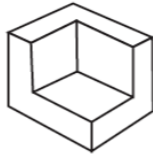


Figure 15

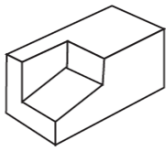
15. What best represents the folded Figure 15?



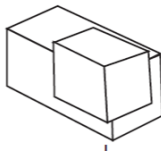
a.



c.



b.



d.

## II. MECHANICAL REASONING

**Instruction.** Please encircle the most appropriate answer.

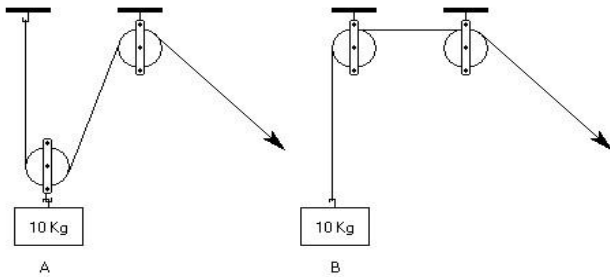


Figure 1

1. Which pulley system requires the least force to move in Figure 1?
- a. Pulley A
  - b. Pulley B
  - c. Both A and B
  - d. None of the above

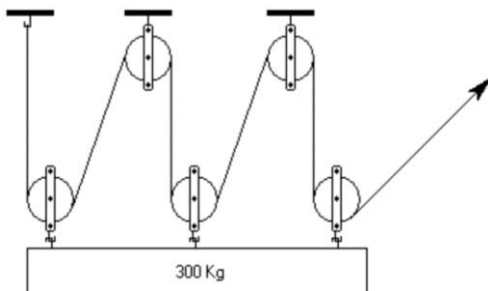


Figure 2

2. How much force is required to move the weight in Figure 2?
- a. 100 kg
  - b. 50 kg
  - c. 250 kg
  - d. 25 kg

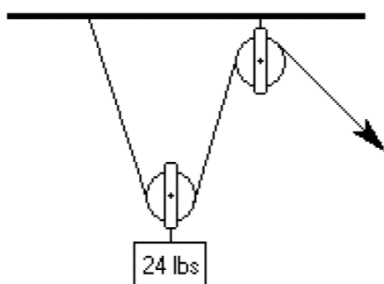


Figure 3

3. Approximately, how much force is needed to lift the weight in Figure 3?
- a. 8 lbs
  - b. 18 lbs
  - c. 12 lbs
  - d. 14 lbs



Figure 4

4. In Figure 4, if gear X turns clockwise, what is the movement of gear Y?
- a. Clockwise
  - b. Counterclockwise
  - c. Anti-clockwise
  - d. Downwards

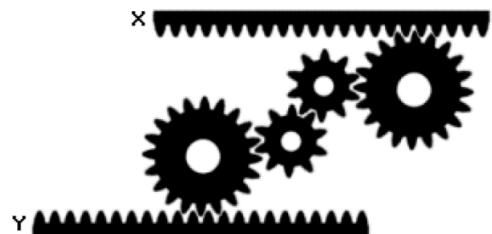


Figure 5

5. In Figure 5, if bar Y moves left at a constant speed, what is the movement of bar X?
- a. Right, Same Speed
  - b. Left, Faster
  - c. Left, Same Speed
  - d. Right, Slower

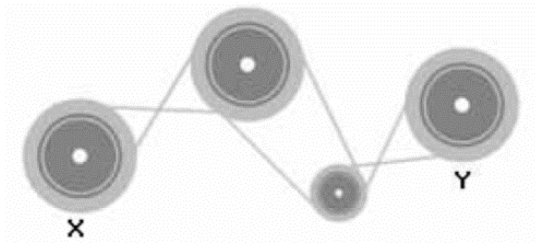


Figure 6

6. In Figure 6, if drive wheel X rotates clockwise at 10 rpm, what is the movement of wheel Y?
- Counterclockwise, Same Speed
  - Clockwise, Faster
  - Counterclockwise, Slower
  - Clockwise, Same Speed

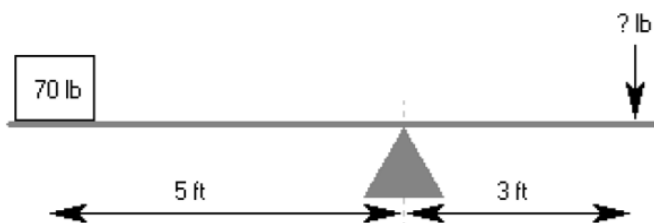


Figure 7

7. In Figure 7, what is the least weight required to tip the lever?
- 120 lbs
  - 117 lbs
  - 115 lbs
  - 110 lbs

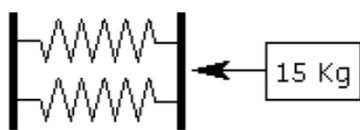


Figure 8

8. As seen in Figure 8, a force of 15 kg compresses the parallel series at 10 cm. What will be the total distance that the springs in series are compressed?
- 15 cm
  - 7.5 cm

b. 2.5 cm

d. 10.5 cm

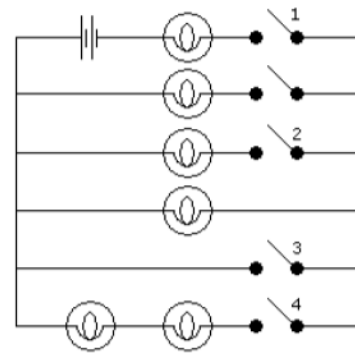


Figure 9

9. Based on Figure 9, how many bulbs will light when switches 1, 2, 3, and 4 are closed?
- 2 bulbs
  - 3 bulbs
  - 4 bulbs
  - 5 bulbs

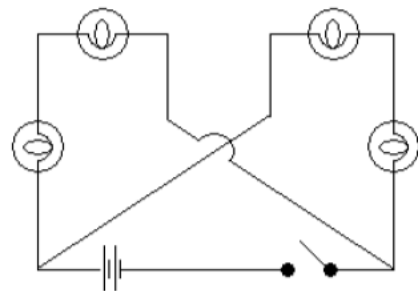


Figure 10

10. Based on Figure 10, how many bulbs will light when the switch is closed?
- 4 bulbs
  - 3 bulbs
  - 2 bulbs
  - 1 bulb

For items 11-15, refer to figure 11.



Figure 11

11. Which tool or combination of tools would be most useful for general woodwork?

- a. 4 and 7
- b. 3, 4, and 7
- c. 2, 3, and 6
- d. 3, 5, and 7

12. Which tool above uses test prods to test voltage, current, and resistance?

- a. 3
- b. 8
- c. 5
- d. 1

13. Which tool or combination of tools above would be most useful for auto body repair work?

- a. 1 and 9
- b. 8 only
- c. 3 and 6
- d. None of the above

14. What tool or combination of tools above would be most useful for tightening nuts?

- a. 8 and 9
- b. 1 and 8
- c. 7 only
- d. None of the above

15. Which tool or combination of tools above would be the most useful for fitting a wooden door?

- a. 1 and 9
- b. 1, 8, and 4
- c. 3, 5, and 7
- d. 2, 5, and 8

### III. VERBAL REASONING

**Instruction.** Please encircle the most appropriate answer.

For items 1-5, determine the synonyms of the words.

1. Observant: Vigilant :: Align: \_\_\_\_\_.

- a. Disembark                      c. Affiliate
- b. Fondness                      d. Subsequent

2. Relent: Acquiesce :: Remiss: \_\_\_\_\_.

- a. Diligent                      c. Imprudent
- b. Sensible                      d. Beautiful

3. Uphold: Sustain :: Magnitude: \_\_\_\_\_.

- a. Infinitive                      c. Proportion
- b. Charm                      d. Slice

4. Genre: Class :: Obsolete: \_\_\_\_\_.

- a. Infinitive                      c. Proportion
- b. Charm                      d. Slice

5. Niche: Segment :: Perks: \_\_\_\_\_.

- a. Deductions                      c. Taxation
- b. Benefits                      d. Residue

For items 6-10, determine the antonyms of the words.

6. Shrewd

- a. Foolish                      c. Intelligent
- b. Discerning                      d. Drink

7. Plummet

- a. Decline                      c. Falter
- b. Rise                      d. Confirm

8. Relapse

- a. Recede                      c. Retreat
- b. Progress                      d. Worsen

9. Particular: General :: Speculation: \_\_\_\_\_.

- a. Reality                      c. Hypothesis
- b. Surmise                      d. Rumor

10. Impromptu: Rehearse :: Audit: \_\_\_\_\_.

- a. Inspect                      c. Ignore
- b. Scrutinize                      d. Collect

For items 11-15, determine the proper order of the given sentences.

11. What is the proper sequence of the given sentences?

**I.** Large buildings have foundations that form the base on which they are constructed.

**II.** They all tend to have a roof, walls, and a floor.

**III.** Buildings come in a huge variety of sizes and shapes from tower blocks and supermarkets to garden sheds.

**IV.** Despite the differences they all serve the same purpose of providing shelter for us and our belongings

- a. I, II, III, IV                      c. II, I, III, IV
- b. III, IV, II, I                      d. II, III, I, IV

12. What is the proper sequence of the given sentences?

**I.** Frames are constructed rising from the foundations.

**II.** The building site is cleared and leveled.

**III.** The interior is decorated.

**IV.** Foundations are built by pouring concrete into the holes.

**V.** Services are installed on each floor.

**VI.** Excavations are made for foundations and basements.

a. VI, II, IV, I, V, III    c. II, VI, IV, I, V, III

b. II, VI, I, IV, V, III    d. II, VI, V, IV, III, I

13.What is the proper sequence of the given sentences?

**I.** It involves the temporary, voluntary movement of people.

**II.** It is estimated that one in ten of the working population is engaged in the industry.

**III.** Affected are the places and people through which they pass and the people who make the trip possible.

**IV.** Tourism is the fast-growing industry in the world today.

a. I, II, III, IV    c. I, IV, I, III

b. IV, II, I, III    d. I, II, IV, III

14.What is the proper sequence of the given sentences?

**I.** The very hot coolant is used to generating steam to drive turbines and produce electricity.

**II.** A nuclear power station uses the energy produced by a controlled nuclear reaction.

**III.** A series of chain reactions occur inside the core and produce heat.

**IV.** The heat is carried away by a coolant circulating the core.

a. I, II, III, IV

c. II, III, IV, I

b. IV, III, II, I

d. III, II, IV, I

15.What is the proper sequence of the given sentences?

**I.** Therefore keeping the walls warm can save heat.

**II.** Office managers who leave the heating on over weekends report lower annual fuel bills than if they turn the heating off at these times.

**III.** This has been proven in several academic studies and is supported by considerable anecdotal evidence.

**IV.** When heating is turned on in a cold building a lot of heat is first used to evaporate condensed moisture in the walls.

a. IV, I, III, II

c. III, IV, I, II

b. I, II, III, IV

d. II, III, IV, I

## **JLSS SAMPLE EXAMINATION – PART 2.A**

### **POWER TEST**

It consists of three (3) sub-parts: English, Mathematics, and Teaching Aptitude.

- Number of Items: 130



## I. ENGLISH

**Instruction.** Please encircle the most appropriate answer.

1. Pilot: \_\_\_\_\_ :: Doctor: Repair  
a. Airplane                      c. Driver  
b. Guide                         d. License
2. Modest: Arrogance  
a. Attractive: Repulsion  
b. Indifferent: Apathy  
c. Scatterbrained: Concentration  
d. Envious: Jealousy
3. Granary: Wheat  
a. Lake: Water  
b. Wine Press: Grapes  
c. Gallery: Works of Art  
d. Archive: Documents
4. \_\_\_\_\_: Unity :: Dearth: Scarcity  
a. Belief                         c. Cohesion  
b. Death                         d. Fear
5. \_\_\_\_\_: Urge :: Enthral: Interest  
a. Confuse                      c. Exhort  
b. Disagree                      d. Enjoy
6. Copper: Metal  
a. Engine: Car                      c. Pen: Pencil  
b. Furniture: Wood                      d. Pepper: Spice
7. Much of the machinery on these farms \_\_\_\_\_ unusable.  
a. Is                                      c. Was
8. According to the police, the killer of the boys in both cities \_\_\_\_\_ probably between the ages of 40 and 50.  
a. Is                                      c. Was  
b. Are                                      d. Were
9. The large companies in our area \_\_\_\_\_ a cheap source of labor.  
a. Need                                      c. Needed  
b. Needs                                      d. None of the choices
10. Without the new taxes, houses built before World War II \_\_\_\_\_ lower costs than more modern houses.  
a. Has                                      c. Had  
b. Have                                      d. Is
11. Two-fifths of the troops \_\_\_\_\_ lost in battle.  
a. Was                                      c. Is  
b. Were                                      d. Are
12. An ambassador is an honest man who lies abroad for the good of his country.  
a. Euphemism                      c. Hyperbole  
b. Pun                                      d. Personification
13. All the world is a stage.  
a. Metaphor                      c. Hyperbole  
b. Paradox                      d. Personification

14. Let him be rich and weary.

- a. Oxymoron                      c. Hyperbole
- b. Paradox                        d. Metaphor

15. The child is the father of the man.

- a. Epigram                        c. Simile
- b. Oxymoron                      d. Metaphor

16. Men may come and men may go, but I go on forever.

- a. Oxymoron                      c. Antithesis
- b. Personification              d. Simile

17. The mountains sing together, the hills rejoice and clap hands.

- a. Antithesis                      c. Metaphor
- b. Personification              d. Simile

18. The soldier fights for glory and a shilling a day!

- a. Climax                          c. Pun
- b. Anticlimax                      d. Simile

19. I desired my dust to be mingled with yours.

- a. Hyperbole                      c. Antithesis
- b. Epigram                        d. Metaphor

20. Many are called, but few are chosen

- a. Antithesis                      c. Personification
- b. Euphemism                    d. Metaphor

21. So innocent arch, so cunningly simple.

- a. Antithesis                      c. Metaphor
- b. Oxymoron                      d. Simile

22. All the perfumes of Arabia will not sweeten this little hand.

- a. Oxymoron                      c. Hyperbole
- b. Antithesis                      d. Personification

23. Fools rush in where angels fear to tread.

- a. Irony                            c. Alliteration
- b. Epigram                        d. Simile

For items 24-30, choose the best word that matches the meaning of the underlined word.

24. The insouciant mother did not blink an eye when her son complained of a tummy ache.

- a. anxious                          c. concerned
- b. untroubled                      d. worried

25. He was already mildly drunk, and Amy knew from experience that it would be a long, bibulous evening.

- a. supreme                          c. absorbent
- b. bedraggled                      d. clear-headed

26. The anti-government groups are constantly accusing the president of lying to hide his turpitude.

- a. maxim                            c. significance
- b. tenuousness                    d. depravity

27. You have profited by their toil to lead a profligate life.

- a. enigmatic                        c. squandering
- b. compelling                      d. thoughtful

28. As we walked past the food stalls our nostrils were assailed by congeries of exotic, unfamiliar smells.

- a. pile                      c. furniture  
b. litter                    d. collection

a                      b                      c  
bush when the hunter killed it. No error.  
d    e

29. The professor became so forceful, so \_\_\_\_\_  
in his expression of opinions, that students  
began to leave his course.

- a. dormant                      c. dogmatic  
b. credible                      d. lucid

30. The older child had a reputation for \_\_\_\_\_  
trouble in high school, but he calmed down in  
college.

- a. instigating                      c. appeasing  
b. curtailing                      d. mortifying

For items 31-35, determine the error in the  
sentence.

31. Which dress is the best of the two that I  
a                                      b  
have shown you? No error.  
c                      d                                      e

32. It had been a delightful discovery on their  
a                      b                                      c  
wedding night that she has been frightened  
d  
and unsure. No error.  
e

33. It is essential that you study well but we might  
a                      b                                      c                      d  
have to fail you.  
No error.  
e

34. No sooner did the rabbit come out of the

35. Three of every four migrating birds in North  
a    b  
America visit the Gulf of Mexico's winter  
c                                      d  
wetlands. No error.  
e

For items 36-40, each passage is followed by  
questions or incomplete statements. Select the  
word or expression that most satisfactorily  
completes each statement or answers each  
question per what is stated or implied in that  
passage.

In the 16<sup>th</sup> century, an age of great marine  
and terrestrial exploration, Ferdinand Magellan  
led the first expedition to sail around the world.  
As a young Portuguese noble, he served the  
King of Portugal, but he became involved in the  
quagmire of political intrigue at court and lost  
the king's favor. After he was dismissed from  
service by the King of Portugal, he offered to  
serve the future Emperor Charles V of Spain.

A papal decree of 1493 had assigned all  
land in the New World west of 50 degrees W  
longitude to Spain and all the land east of that  
line to Portugal. Magellan offered to prove that  
the East Indies fell under Spanish authority.  
One year later, one of these ships explored the  
topography of South America in search of a  
water route across the continent. This ship  
sank, but the remaining four ships searched

along the southern peninsula of South America. Finally, they found the passage they sought near 50 degrees S latitude. Magellan named his passage the Strait of All Saints, but today it is known as the Strait of Magellan.

36. The 16<sup>th</sup> century was an age of great \_\_\_\_\_ exploration.

- a. cosmic                      c. territorial
- b. land                         d. underwater

37. Magellan lost the favor of the king of Portugal when he became involved in a political \_\_\_\_\_.

- a. entanglement            c. negotiation
- b. discussion                d. problem

Marie Curie was one of the most accomplished scientists in history. Together with her husband, Pierre, she discovered radium, an element widely used for treating cancer and studied uranium and other radioactive substances. Pierre and Marie's amicable collaboration later helped to unlock the secrets of the atom.

Marie was born in 1867 in Warsaw, Poland, where her father was a professor in physics. At an early age, she displayed a brilliant mind and a blithe personality. Her great exuberance for learning prompted her to continue with her studies after high school. She became disgruntled, however, when she learned that the university in Warsaw was closed to women. Determined to receive a higher education, she defiantly left Poland and in 1891 entered the Sorbonne, a French

university, where she earned her master's degree and a doctorate in physics.

Marie was fortunate to have studied at the Sorbonne with some of the greatest scientists of her day, one of whom was Pierre Curie. Marie and Pierre were married in 1895 and spent many productive years working together in the physics laboratory. A short time after they discovered radium, Pierre was killed by a horse-drawn wagon in 1906. Marie was stunned by this horrible misfortune and endured heartbreaking anguish.

38. The Curie's \_\_\_\_\_ collaboration helped to unlock the secrets of the atom.

- a. friendly                      c. courteous
- b. competitive                d. industrious

39. Marie had a bright mind and a \_\_\_\_\_ personality.

- a. strong                        c. humorous
- b. light-hearted                d. strange

40. When she learned that she could not attend the university in Warsaw, she felt \_\_\_\_\_.

- a. hopeless                      c. annoyed
- b. depressed                    d. worried

## II. MATHEMATICS

**Instruction.** Please encircle the most appropriate answer.

1. Find the length of the radius of the circle:

$$x^2 + y^2 + 4x - 6y - 3 = 0.$$

- a. 16                      c. 8  
b. 4                        d.  $2\sqrt{2}$

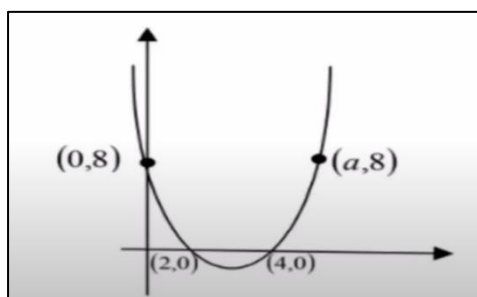


Figure 1

2. In Figure 1, the x-intercepts of a parabola are 2 and 4, and the y-intercept is 8. If the parabola passes through the point  $(a, 8)$ , what is the value of  $a$ ?

- a. 8                        c. 6  
b. 7                        d. 5

3. For what value of  $x$  does  $1 + 2 + 3 + 4 + 5 + \dots + x = 171$ ?

- a. 17                      c. 16  
b. 15                      d. 18

4. Let  $a$  and  $b$  be the roots of the quadratic equation:  $(x - 2)(x - 3) + (x - 3)(x + 1) + (x + 1)(x - 2) = 0$ .

Evaluate:  $\frac{1}{(a+1)(b+1)} + \frac{1}{(a-2)(b-2)} + \frac{1}{(a-3)(b-3)}$ .

- a.  $\frac{3}{7}$                       c. 0  
b.  $\frac{4}{15}$                       d.  $\frac{1}{4}$

5. Which of the following relations are functions?

- I.  $x^2 + y^2 = 4$                       IV.  $x = y^2 - y - 6$   
II.  $x - y = 4x$                       V.  $y = x^2 + 5x + 6$   
III.  $y = \sqrt{4} - x$                       VI.  $x^2 = y^2$

- a. II, III, IV                      c. I, IV, VI  
b. II, III, V                      d. I, II, III

6. A jar contains 12 blue marbles, 8 red marbles, and 20 green marbles. You pick one marble from the jar. Find the theoretical probability,  $P$  (blue or green).

- a.  $\frac{4}{5}$                       c.  $\frac{2}{5}$   
b.  $\frac{1}{21}$                       d.  $\frac{3}{20}$

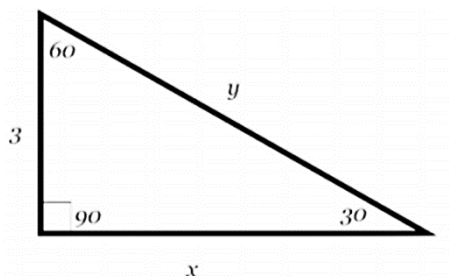
7. Solve the following by completing the squares:  $x^2 + 6x - 2 = 0$

- a.  $\sqrt{11} \pm 3$                       c.  $3 \pm \sqrt{11}$   
b.  $\pm 3$                       d.  $-3 \pm \sqrt{11}$

8. You blindly guessed the last five multiple-choice items (4 choices) of a practice test. What is the probability that you will answer all five questions correctly?

- a.  $\frac{1}{40}$                       c.  $\frac{1}{1024}$   
b.  $\frac{1}{16}$                       d.  $\frac{1}{20}$

9. Write the equation of the parabola with vertex (9, -2) and point (12, 16) in vertex form.
- a.  $y = (x + 9)^2 + 2$       c.  $y = 2(x - 9)^2 - 2$   
b.  $y = (x - 12)^2 - 16$       d.  $y = 3(x + 12)^2 + 16$
10. A circle with the equation  $(x - 2)^2 + (y - 2)^2 = 4$  is on the xy-coordinate plane. What is the point on the circle opposite the point (0, 2), which is also on the circle?
- a. (2,0)      c. (0,-2)
11. Which equation represents a hyperbola?
- a.  $y = 16x^2$       c.  $y^2 = 16 - x^2$   
b.  $y = 16 - x^2$       d.  $y = \frac{16}{x}$
12. Find the equation of the line that passes through the point (-2,-5) and is parallel to the line  $5x - 4y = 2$ .
- a.  $5x - 4y = -17$       c.  $-2x - 5y = 2$   
b.  $5x - 4y = 10$       d.  $5x + 4y = 2$
13. Given the inequality  $-6x - 4 < \frac{5x+4}{-1}$ , what are the possible values of x?
- a.  $\{x|x > 0\}$       c.  $\{x|x = 1\}$   
b.  $\{x|x < 0\}$       d.  $\{x|x \in W\}$
14. Given the equation  $\log_5 b = 3$ . What is the value of b?
- a. 15      c. 125  
b. 5/3      d. 10
15. For general exponential functions, where  $f(x) = b^x$  what should be the value of base b?
- a. a negative integer      c. a whole number  
b. a positive integer      d. a positive constant
16. If  $\tan \theta = -\frac{1}{2}$  and  $270^\circ \leq \theta \leq 360^\circ$ , what is  $\sin \theta$ ?
- a.  $-\frac{1}{\sqrt{5}}$       c.  $\frac{1}{2}$   
b.  $\frac{1}{\sqrt{5}}$       d. cannot be determined
17. How many possible combinations are there if Sonya has 3 pairs of shorts, 4 blouses, and 5 pairs of shoes?
- a. 300      c. 12  
b. 60      d. 50
18. Myra, Mica, Mike, Mikki, and Marla are sitting at a round table when they thought of exchanging seats and counting all the possible arrangements they can do. How many arrangements would they count in the end?
- a. 60      c. 5  
b. 24      d. 120
19. The vertex of the parabola:  $y^2 = 12x$  is:
- a. V (0,0)      c. V (-3,0)  
b. V (0,3)      d. V (-3,3)
20. Given the figure below, what is the value of y?



- a. (3,0)                      c. (2,0)  
b. (2,0)                      d. (4,0)

26. What is the value of  $\lim_{x \rightarrow 5} (3x - 7)$ ?

- a. 8                              c. 5  
b. -8                            d. -5

27. Suppose  $x + y = 3$ ,  $x^2 + y^2 = 13$ . Find the value of  $xy$ .

- a. 39                              c. 24  
b. -2                              d. -6

28. The arithmetic mean of 14 numbers is what percent of the sum of the same 14 numbers? (Answer must be decimal to the nearest hundredth.)

- a. 7.69%                      c. 7.14%  
b. 8.33%                      d. 5.88%

29. Find the probability of getting 3 aces out of a deck of 52 cards if 5 cards are to be drawn at a time.

- a.  $4C_3$                               c.  $4C_3 \cdot 48C_2 / 52C_5$   
b.  $4C_3 \cdot 52C_2 / 52C_5$               d.  $52C_3 / 52C_5$

30. What is the derivative of the trigonometric function  $\sec \theta$ ?

- a.  $(\sec \theta)^2 d\theta$                       c.  $\sec \theta \tan \theta d\theta$   
b.  $-(\csc \theta)^2 d\theta$                       d.  $-\csc \theta \cot \theta d\theta$

31. Given that  $81^m = 3$  and  $m^n = 64$ . Find the value of  $mn$ .

- a.  $-\frac{1}{2}$                               c.  $-\frac{3}{4}$   
b. -1                                d.  $-\frac{1}{4}$

- a.  $\sqrt{3}$                               c. 6  
b.  $2\sqrt{3}$                             d. 12

21. Which of the following is the derivative of a constant?

- a. 1                      c.  $\frac{1}{2}$   
b. 0                      d. cannot be determined

22. The graph of  $16x - 2y = 48$  intersects the y-axis at the point (a,b). What is the sum of a and b?

- a. -24                              c. -4  
b. 32                                d. 12

23. How many 3-digit numbers can be formed from the digits 0, 1, 2, and 3, if each digit can be used only once?

- a. 24                                c. 12  
b. 18                                d. 20

24. Find the sum of the arithmetic series 1, 5, 9, 13, ..., 45.

- a. 300                              c. 276  
b. 297                              d. 254

25. In the parabola with the equation  $y = x^2 + 2x - 3$ , with an axis of symmetry at  $x = -1$ , what is the ordered pair that has the same y-value as the ordered pair (-3,0)?

32. If  $\log_{10} x + \log_{10} 8 = \log_{10} 16$ , then  $x$  is equal to \_\_\_\_.
- a.  $\frac{1}{2}$                       c. 4  
b. 2                          d. 8
33. Given  $\lim_{x \rightarrow 3^+} f(x)$ , what is the  $\lim_{x \rightarrow 3^+} f(x)$ ?
- a. -2                      c. 0  
b. -2                      d. does not exist
34. Given the equation  $4^3 = |2y + 6|$ , what is a possible real value of  $y$ ?
- a. -35                      c.  $\sqrt[3]{2x} = 6$   
b.  $y$  has no real values      d. -32
35. What is the equivalent of  $\frac{\cot \theta}{\tan \theta}$ ?
- a.  $\frac{\sin \theta}{\cos \theta}$                       c. 1  
b.  $\frac{\cos^2 \theta}{\sin^2 \theta}$                       d.  $\frac{\sin^2 \theta}{\cos^2 \theta}$
36. The equation of a parabola having its focus at  $(0, P)$  and having its directrix the line  $y = -P$  is:
- a.  $y^2 = 4px$                       c.  $x^2 = 4py$   
b.  $y^2 = -4px$                       d.  $x^2 = -4py$
37. Given the series 1, 5, 13, 29, ..., what is the 6th term?
- a. 106                      c. 61  
b. 53                          d. 125
38. What is the value of  $\lim_{x \rightarrow 1^-} \sqrt{(1 - x^2)}$ ?
- a. -0.5                      c. 0  
b. 0.5                          d. does not exist
39. Ms. Anna would be giving awards to 4 out of her students in section Narra. If each student can receive at most one award and section Narra is composed of 30 students, how many possible selections are there?
- a. 60                          c. 27, 405  
b. 120                          d. 657, 720
40. What is the value of the following integral of the trigonometric function:  $\int \tan u \, du$ ?
- a.  $\sec^2 u + c$                       c.  $\ln|\sec u| + c$   
b.  $-\csc^2 u + c$                       d.  $\ln|\sec u + \tan u| + c$



### III. TEACHING APTITUDE

**Instruction.** Please encircle the most appropriate answer

1. Ms. Martinez observed her students lacking some discipline. What would she do to develop the quality of discipline among her students?
  - a. She should make rules of conduct for her students.
  - b. She should allow her students to take responsibility.
  - c. She should banish her students.
  - d. She should make her students obey the rules.
2. Teacher Lily wants to evaluate her students. Which of the following question types should she use?
  - a. Essay Type
  - b. Short Answer Type
  - c. Objective Type
  - d. All of the above
3. You are to grade the students in their practical examination, what should you do?
  - a. Grade the students based on their behavior with support staff, other students, and yourself.
  - b. Encourage them to come to you for private learning.
  - c. Impartially grade the students based on their performance.
  - d. None of the above
4. As a teacher, what should you do to improve your teaching?
  - a. Correct your own mistakes.
  - b. Criticize the previous teacher.
  - c. Act against the policies of the school.
  - d. Punish students for your own mistake.
5. Mrs. Villanueva gave an examination without notice to her students. What is the use of this?
  - a. She gave it to her students because she has not prepared a lesson.
  - b. It created fear in the mind of students and kept them regular in their studies.
  - c. It helped her to correctly evaluate her students' knowledge.
  - d. All of the above.
6. Suppose you have a student with weak eyesight, what arrangement should you make regarding the boards?
  - a. He/ She should be given a front seat.
  - b. Provide him/her with spectacles.
  - c. Give them a laptop.
  - d. No need to take any action.
7. Mr. De Castro notices that back-benchers are always talking during the class. What should he do?
  - a. He should punish them.

- b. He should ask them to sit on the front benches.
- c. He should do nothing and let them do what they are doing.
- d. None of the above
8. Maximum participation of students is possible in teaching through what method?
- Discussion method
  - Lecture method
  - Audio-Visual Aids
  - Textbook method
9. Which of the following are the characteristic features of an effective teacher?
- A teacher teaches with enthusiasm.
  - A teacher puts the emphasis more on teaching than on class control.
  - A teacher finds fault in his/ her students.
  - A teacher is interested in making the subject matter understood rather than completing the course.
- I and IV only
  - III only
  - I, III, and IV
  - I, II, and IV
10. If you are to meet your students for the first time, what should you do?
- You should give a broad outline of the whole subject.
  - You should develop a rapport with the class.
  - Start teaching without caring about the students' likes and dislikes.
- IV. Show your students that you aspire to be objective.
- I, II, III, and IV
  - I, II, and III
  - I, II, and IV
  - I and IV
11. What does John Locke's phrase of *tabula rasa* mean?
- Tal and Ras
  - Mind is a result of evolution
  - Free Education
  - None of the above
12. What is/are the professional requirement/s of a professional teacher as explained in the UNESCO publication?
- Justice to the profession
  - Mastery over the subject and competency in teaching
  - Innovativeness in approach and teaching strategies
  - All of the above
13. What does a teacher's professionalism mean?
- It is the extent to which a teacher subscribes to a professional code.
  - It means that a teacher must have completed a professional teachers training course before his/ her appointment.
  - It means that a teacher has to teach just for salaries
  - All of the above

14. Which of the following statements is/are correct about motivation?
- a. According to Berlyne, curiosity, and level of aspiration are the motivating factors.
  - b. According to Burt, inborn, unlearned tendencies, called instincts are the motivating forces.
  - c. According to Plato, the motivating factors are free will, intellect, and reason.
  - d. All of the above
15. Suppose you are unable to answer your student's question, what will you do?
- a. Try to answer the question even if you do not know the answer.
  - b. Assert that the question is wrong.
  - c. Find out the answer and tell the student later.
  - d. Ask him to find the answer for himself.
16. As a teacher, what should you do if the exams are near and the course is still incomplete?
- a. Take extra classes in school to complete the course.
  - b. You should make your students skip questions in exam papers related to undiscussed topics.
  - c. Complete the course at home.
  - d. Make your students do some self-study.
17. \_\_\_\_\_ is/ are a teacher's most precious asset.
- a. Being impartial
  - b. Books
  - c. School
  - d. Student's faith
18. What is the objective of class tests?
- a. To assess how much did the students understand.
  - b. Training for exams
  - c. For revisions
  - d. All of the above
19. Who asserted that Psychology is directly concerned with human behavior?
- a. Goldsworth
  - b. Harrison
  - c. Maslow
  - d. Reddington
20. How to manage classroom discipline effectively?
- a. A teacher should have a curriculum depending on the interest of the students.
  - b. A teacher should know the cause of discipline and handle it with a stern hand.
  - c. A teacher should wear fancy clothes in the classroom.
  - d. None of the above.
21. Which of the following defines learning the best?
- a. Inculcation of knowledge
  - b. Acquisition skills

- c. Modification of behavior
- d. Personal adjustment

- d. Developing the students' critical, logical, and reasoning abilities

22. A teacher's professionalism may be assessed in terms of any of the following, except:

- a. Religion and caste engagement
- b. Engagement with the career and with students
- c. Commitment to society and parents
- d. Commitment to the colleagues and employer

23. If there are some disruptions in the classroom while you are delivering a lecture, you should:

- a. Punish those who cause chaos.
- b. Do not bother with what's going on in the classroom.
- c. Hold on for a bit and then carry on.
- d. None of the above.

24. Teaching's primary purpose is to:

- I. Share knowledge and information
- II. Improve learner's reasoning skills
- III. Assess students' knowledge
- IV. Develop thinking skills of students

- a. I only
- b. I and III
- c. II and IV
- d. I, II, and IV

25. A teacher should set an examination that is:

- a. Easy to comprehend by the students
- b. Complex and out of the syllabus
- c. Easy for the students to finish within the duration

26. What is true about the following statements?

- A.** Higher education is meant to promote critical and creative thinking skills among students.
- B.** Such skills ensure job placements.

- a. (A) and (B) are both true and (B) is the right interpretation of (A).
- b. (A) and (B) are both true and (B) is not the right reason for (A).
- c. (A) is true and (B) is false.
- d. (B) is true and (A) is false.

27. An efficient teacher is someone who

- a. Observes punctuality in class
- b. Governs and manages the class
- c. Makes learning interesting and motivates students to learn
- d. Gives creative assignments

28. Which one of the following statements is true in the context of multiple-choice type questions?

- a. They are more objective than questions of true-false type.
- b. They are less objective than essay-type questions.
- c. They are more subjective than questions of short-answer type.
- d. They are more subjective than true-false-type questions.

29. Students who are hyperactive need to be:

- a. Put in place
  - b. Asked to maintain a low profile in class
  - c. Given a break during sessions
  - d. Given additional exercises to keep them engaged
30. It is important for a teacher to:
- a. Share all information whether relevant or not
  - b. Merely share what he/she knows
  - c. Refrain from sharing crucial knowledge and expertise
  - d. Believe in what he/shares as knowledge
31. In teaching, the first important step is:
- a. Planning beforehand
  - b. Knowing students' background
  - c. Organizing material to be thought
  - d. All of the above
32. Suppose you are an ambitious teacher. For classroom teaching, you have high ideals, but your hard work goes in vain. The reason behind this problem may be:
- a. Your level of teaching is above the level of student capacity.
  - b. Individual differences among students make your efforts futile.
  - c. Both of these
  - d. None of the above.
33. A good teacher is someone who:
- a. Gives printed notes to students
  - b. Explains concepts and principles
  - c. Gives useful information
  - d. Inspires students to learn
34. Television is superior to radio as teaching because it:
- a. Is costly
  - b. Invites two senses at the same time
  - c. Is generally liked by pupils
  - d. All of the above
35. Which of the following is true about Dyslexia?
- a. It is a disorder characterized by difficulty in muscle control.
  - b. It is a learning disability that affects reading and related language-based processing skills.
  - c. It is a learning disability that affects a person's handwriting ability and fine motor skills.
  - d. None of the above.
36. It is presumed that a teacher offers quality education when:
- a. Students can develop their knowledge, and skills and participate in creative academic activities.
  - b. There is high attendance in class.
  - c. Students get a high percentage in the subject
  - d. Both A and C
37. A dynamic teaching approach means
- a. Students should learn through activities.

- b. Teaching should be forceful and effective.
  - c. The topics of teaching should be dynamic
  - d. Teachers should be energetic and dynamic
38. Educational philosophy should be studied by educators because
- a. They do not have their philosophy.
  - b. They do not know it.
  - c. They may improve their work by clarifying their philosophy.
  - d. Philosophy is the backbone of all disciplines.
39. A good teacher must be:
- a. Resourceful and autocratic
  - b. Resourceful and authoritative
  - c. Resourceful and dominant
  - d. Resourceful and participative
40. Teachers' attitude that affects teaching pertains to
- a. Conative domain
  - b. Affective domain
  - c. Cognitive domain
  - d. Psychomotor domain
41. When individuals grow older, the \_\_\_\_\_ of learning declines.
- a. Quantity
  - b. Quality
  - c. Speed
  - d. Power
42. Who is the father of the "Theory of Multiple Intelligence"?
- a. Bruner
  - b. Gardner
  - c. Piaget
  - d. Vygotsky
43. Quality of education in a school/college can be measured through
- a. Available infrastructural facilities
  - d. Manpower, teachers, and principal
  - c. Students achievement
  - d. All of the above
44. The greater the handicap of students coming to the educational institutions, the greater the demand on
- a. Teacher
  - b. Family
  - c. Society
  - d. State
45. Bad behavior of a student needs to be
- a. Reported to the management
  - b. Punished
  - c. Discussed in private with the student
  - d. Discussed in front of parents and disciplinary committee
46. The quality of teaching is reflected by:
- a. The passing rate of students
  - b. The attendance of students in the class
  - c. The quality of the question asked by students

d. The duration of silence maintained in the class.

c. The self, selected methods of communication and the message

d. The communication channel, other communicators, and external factors

47. Giving students homework may help them

- a. Remain busy at home
- b. Study at home
- c. Check their progress
- d. Develop a habit of self-study

48. Education aims to:

- a. Develop vocational skills in students
- b. Prepare students for practical life
- c. Develop social awareness in the students
- d. Prepare the students for examination

49. Arrange the following teaching process in order

- I. Relating the present knowledge with the previous knowledge
- II. Evaluation
- III. Reteaching
- IV. Formulating objectives
- V. Presentation of materials

- a. IV, I, V, II, III
- b. IV, V, I, III, II
- c. IV, II, V, III, I
- d. IV, V, I, II, III

50. A teacher in a classroom has immediate control over

- a. The audience, the noise, and the reception
- b. The feedback, the technology, and the audience experience

## **JLSS SAMPLE EXAMINATION – PART 2.B**

### **POWER TEST | SPECIALIZATION**

It consists of three (3) parts: Science, Engineering, and ICT

- Number of Items: 170



## I. SCIENCE

**Instruction.** Please encircle the most appropriate answer.

- A truck travels 87 miles north in 2 hours and then 147 miles south in 5 hours. Suppose that the truck is 2,800 kilograms, calculate its average speed.
  - 32.45 mph
  - 32.42 mph
  - 33.42 mph
  - 33.43 mph
- Given that vector  $\vec{A} = 5.0\hat{i} + 2.3\hat{j} - 6.4\hat{k}$  and  $\vec{B} = 12.0\hat{i} - 4.7\hat{j} + 9.3\hat{k}$ , what is  $\vec{A} \times \vec{B}$ ?
  - $8.69\hat{i} - 123.3\hat{j} - 51.1\hat{k}$
  - $-8.69\hat{i} - 123.3\hat{j} - 51.1\hat{k}$
  - $8.69\hat{i} + 123.3\hat{j} - 51.1\hat{k}$
  - $8.69\hat{i} + 123.3\hat{j} + 51.1\hat{k}$
- When an object is placed in a higher position, what increases?
  - Velocity
  - Weight
  - Potential Energy
  - Kinetic Energy
- From rest at a constant rate of  $2.5 \text{ m/s}^2$  for 10 seconds, a truck speeds up. How fast is it moving after 10 seconds?
  - 625 m/s
  - 630 m/s
  - 25 m/s
  - 10 m/s
- A flashlight has four identical 2.5 volts batteries arranged in a chain to give a total of 10 volts. Current passes through battery A, then through battery B, then through battery C, and battery D, on its way to the bulb. When the flashlight operates, the batteries provide power to the current and they gradually use up their chemical potential energy. Which battery will run out of chemical potential energy first?
  - Battery A and B
  - Battery C and D
  - Battery A because it is the first one which the current passes through.
  - All batteries will run out.

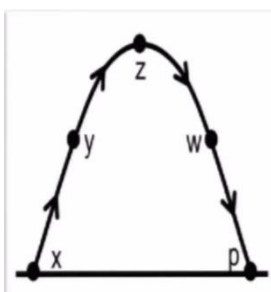


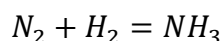
Figure 1

- Consider the projectile shown in Figure 1. Assuming that there is no air resistance, which of the following statement is true
  - Velocity at point Z is zero.
  - Speed at point X is equal to the speed at point P.
  - Acceleration at point Z is zero.
  - Velocity at point Y is equal to the velocity at point W.
- A concave mirror with a focal length of 12.0 cm creates a real image 36.0 cm away on its principal axis; the corresponding object is located how far from the mirror?

- a. 16 cm                      c. 15 cm                      b. 2.2 mA                      d. 21.4 mA  
b. 18 cm                      d. 13 cm
8.  $S_1$  and  $S_2$  are spheres with the same radii, 7 cm.  $S_1$  is hollow but  $S_2$  is solid. Which of the spheres cool at a faster rate?  
a.  $S_1$   
b.  $S_2$   
c. They will cool at the same rate because they have the same radii.  
d. Neither  $S_1$  nor  $S_2$ .
9. Ice layers with a thickness of 1 cm are formed in 24 hours. What will be the time taken for the ice layers to form an additional 1 cm thickness?  
a. 48 hours                      c. 72 hours  
b. 24 hours                      d. 106 hours
10. A mug cools down from  $45^\circ\text{C}$  to  $35^\circ\text{C}$  in 6 minutes. In what further time will it cool down from  $35^\circ\text{C}$  to  $25^\circ\text{C}$ ? Assume that the surrounding is  $10^\circ\text{C}$ .  
a. 10 minutes                      c. 9 minutes  
b. 7 minutes                      d. 6 minutes
11. A ball weighs 1 kg and is traveling at a speed of 15 m/s. Calculate its kinetic energy.  
a. 110.5 J                      c. 109.5 J  
b. 111.5 J                      d. 112.5 J
12. A resistor is connected across a 50 V source. What is the current resistor if the color code is red, orange, orange, and silver?  
a. 2 mA                      c. 214 mA
13. After the Christmas and New Year celebrations, there are many food leftovers in your fridge. For spaghetti to maintain its taste after being refrigerated for three days, you decided to heat it in a microwave. What type of heat transfer is involved when heating dinner in a microwave?  
a. Conduction                      c. Convection  
b. Radiation                      d. None of the above
14.  $Q$  is the rate flow of heat through a cylindrical conductor A, having a cross-sectional radius ( $r$ ) and length ( $l$ ) when its ends are maintained at temperature  $\Delta\theta$ . Find the heat current through another conductor B having a radius, 2 cm, and a length, 3 cm, with its ends, maintained at the same temperature difference.  
a.  $\frac{2}{3} Q$                       c.  $\frac{4}{3} Q$   
b.  $\frac{3}{2} Q$                       d.  $\frac{3}{4} Q$
15. What is the working principle of a washing machine?  
a. Reverse Osmosis                      c. Centrifugation  
b. Diffusion                      d. Dialysis
16. Anna wants to produce crops. However, her crops could not live that long because of a disease. She wants to develop a crop with a disease-resistant variety. What should Anna do first?  
a. Hybridization  
b. Mutations

- c. Selection  
d. Production of the crop
17. In PUP Lagoon, there is a rapid growth of microscopic, unicellular algae, called Algal bloom. What causes the algal bloom?
- a. Global Warming      c. Eutrophication  
b. Salination              d. Biomagnification
18. What does the acronym, ATP, mean?
- a. Adenine Triphosphoric  
b. Adenosine Triphosphate  
c. Amylase Triphenylithium  
d. Sugar
19. Carbon dioxide is one of the raw materials that plants need to make food. Where does the gas exchange in plants occur?
- a. Stomata                  c. Stem  
b. Roots                    d. Flower
20. Uncharged molecules can pass easily through the membrane with the help of proteins. Which type of membrane transport is used for the movement of a substance in a single direction?
- a. Uniport                  c. Co-Transport  
b. Antiport                d. Channel
21. *Drosophila melanogaster*, or fruit flies, were placed in a test tube. The edge of the other side of the tube contains sucrose. Assuming that other external factors were controlled, how will the fruit flies react?
- a. There will be a reaction. Two to five fruit flies may go to the edge with sucrose.  
b. There will be a significant reaction. The fruit flies will move away from the edge with sucrose.  
c. There will be a significant reaction. The fruit flies will move toward the edge with sucrose.  
d. There will be no reaction.
22. A white-furred rabbit breeds a black-furred rabbit, and all their offspring have a phenotype of gray fur. What does the gene for fur color rabbits appear to be an example of?
- a. Mosaicism  
b. Codominance  
c. Incomplete dominance  
d. Complete dominance
23. Suppose that in barley plants, the allele for tall stalks is dominant over short stalks and the allele for wide leaves is dominant over thin leaves. What would be the best way to determine the genotype of a barley plant with a tall stalk and wide leaves?
- a. Perform a testcross with a barley plant that has a tall stalk and thin leaves.  
b. Perform a testcross with a known heterozygous barley plant.  
c. Perform a testcross with a barley plant that has a short stalk and thin leaves.

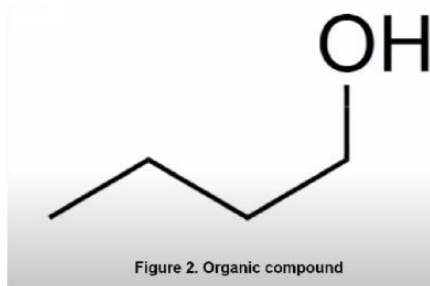
- d. Perform a testcross with a barley plant that has a tall stalk and wide leaves.
24. In the ABO blood group system in humans, if a person of type-B blood has children with a person of type AB blood, what possible blood types could their children have?
- Type AB, Type B, and Type O
  - Type A and Type B
  - Type A, Type B, and Type AB
  - Type B and Type AB
25. Which of the following is the most important structure related to microbial attachment to cells?
- Flagellum
  - Plasmid
  - Peptidoglycan
  - Glycocalyx
26. The arm of a human, the wing of the bat or a bird, and the forelimb of a dog are said to be homologous structures. This indicates that:
- They have the same function.
  - Bats evolved from a lineage of dogs.
  - They are structures that are similar due to common ancestry.
  - They have a different ancestry but a common function.
27. An alteration in the arrangement of nucleotides in a chromosome, possibly resulting in either a structural or physiological change in the organism is called:
- Genetic Drift
  - Mutation
  - Natural Selection
  - Gene Flow
28. Individuals within a species tend to be genetically different. The primary mechanism generating this individual variability is:
- Duplications
  - Mitosis
  - Meiosis
  - Polyploidy
29. Darwin's theory of natural selection did not have a full explanation of how evolution could occur. This was due to:
- Darwin's failure to recognize the tendency of organisms to over-reproduce.
  - Darwin's initial overemphasis of the significance of genetic drift.
  - The absence of biochemical techniques to determine the genetic similarities between species.
  - The accurate mechanisms of genetic inheritance were not widely known.
30. The most compelling evidence for large-scale evolutionary change or macroevolution is:
- The observed increase of mutation rates across all species.
  - Fossil record
  - The occurrence of mass extinction.
  - Domestication of plants and animals.
31. The present periodic table lists the elements in order of increasing \_\_\_\_.
- Atomic Mass
  - Mass Number
  - Number of electrons
  - Number of neutrons
32. The Haber-Bosch process is an important chemical reaction, mainly applied in the production of fertilizers,



What is the sum of the coefficients of this reaction when balanced with the smallest whole number coefficients?

- a. 2                      c. 5
- b. 4                      d. 6

For numbers 33-35, use the figure below.



33. Which of the following is the correct IUPAC nomenclature for the organic compound illustrated in the figure?

- a. Butan-1-ol
- b. Butanoic acid
- c. Pentan-1-ol
- d. Pentan-2-one

34. What is the molar mass of the organic compound from Figure 2? (C=12, O=16, H=1)

- a. 72 g/mol              c. 86 g/mol
- b. 74 g/mol              d. 88 g/mol

35. The organic compound illustrated in Figure 2 is a \_\_\_\_\_ alcohol.

- a. Primary              c. Tertiary
- b. Secondary           d. Quaternary

36. The oxidation of this organic compound illustrated above will produce a/an \_\_\_\_\_.

- a. Alkane                  c. Ketone
- b. Alkene                  d. Carboxylic acid

37. Which of the following will increase the product yield for Reaction X?



- I. Increase the pressure
- II. Increase the temperature
- III. Increase the amount of catalyst added
- IV. Increase the concentration of the reactants

- a. I and IV                  c. I, II, and IV
- b. II and IV                d. I, II, III, IV

38. Which of the following are the correct descriptions of an acid, based on the prevailing theories of scientists?

- I. An acid is a proton donor.
- II. An acid is an electron pair donor.
- III. Acids produce hydrogen ions in a solution

- a. I and II                  c. II and III
- b. I and III                d. I, II, and III

39. Which of the following periodic trends is associated with the removal of an electron(s) from an atom?

- I. Electronegativity
- II. Electron affinity
- III. Ionization energy

- a. II only                    c. I and II
- b. III only                  d. I and III

40. Okra juice has a pOH of 9.35. Calculate its  $[H^+]$ .
- $1.71 \times 10^{-4} \text{ M}$
  - $2.23 \times 10^{-5} \text{ M}$
  - $4.47 \times 10^{-5} \text{ M}$
  - $5.54 \times 10^{-5} \text{ M}$
41. Which of the following describes the relationship between graphite and diamond?
- Graphite and diamond are isotopes of carbon.
  - Graphite and diamond are isomers of carbon.
  - Graphite and diamond are allotropes of carbon.
- I only
  - II only
  - III only
  - II and III
42. Which of the following is the mass percentage of Potassium chloride in a solution containing 3.0 g of KCl in 100.0 mL of water? (Density of water =  $1 \text{ g/cm}^3$ )
- 2.91%
  - 0.97%
  - 3.88%
  - 7.76%
43. Which of the following is/are correct about the Oxide ion,  $O^{2-}$ ?
- The number of protons is greater than the number of electrons.
  - The number of electrons is greater than the number of protons.
  - The number of protons is equal to the number of electrons.
- I only
  - II only
  - III only
  - II and III
44. An unknown liquid, X, was heated until it evaporated, and a white residue was observed at the bottom of the beaker. Liquid X is a/an \_\_\_\_\_.
- Element
  - Pure substance
  - Compound
  - Mixture
45. For an electron with a principal quantum number of 3, which of the following is not an allowed value for its magnetic quantum number?
- 0
  - 1
  - 2
  - 2
46. Inner planets: Mercury, Venus, Earth, and Mars, were formed by \_\_\_\_\_.
- Masses of cold hydrogen and helium.
  - Collision with large galaxies.
  - Supernovas
  - Repeated collisions of asteroid-sized debris.
47. What type of volcano is composed of lava flows and pyroclastic material and is steep-sided and very tall?
- Syncline
  - Composite cone
  - Anticline
  - None of these
48. Different waves pass through the Earth's inner layers. With this, we can understand the characteristics of each layer. The outer core is liquid because.

- a. P waves pass through it.
  - b. S waves pass through it.
  - c. P waves cannot pass through it.
  - d. S waves cannot pass through it.
49. In geological studies, a fracture in the earth's surface along which movement has taken place is termed:
- a. Tension fracture    c. Fault
  - b. Gash fracture    d. None of the above
50. In geological studies, a fault in the earth's surface along which primarily horizontal movement has taken place is termed:
- a. Strike-slip fault    c. Reverse fault
  - b. Overthrust fault    d. None of the above
51. What percentage of earth's water is freshwater?
- a. 50%    c. 7%
  - b. 22%    d. 3%
52. High-quality crop soil requires humus as a major component. Which of the following best describes the composition of humus?
- a. Fine sand and particles
  - b. Decaying organic matter.
  - c. Mineral like clay matter
  - d. Chemical fertilizers
53. It is the molten rock beneath the Earth's crust that is used to generate geothermal energy and to bring all the key ingredients for life to the surface of the Earth.
- a. Magma    c. Liquidity
  - b. Lava    d. Igneous
54. The jet stream lies between which two layers of the earth's atmosphere?
- a. Thermosphere and ionosphere
  - b. Mesosphere and thermosphere
  - c. Troposphere and stratosphere
  - d. Stratosphere and mesosphere
55. This is the earliest subdivision of the Paleozoic Era. Many of the oldest known invertebrate fossils occur in this period, the principal types being trilobites, chitinous brachiopods, and primitive graptolites. What is this period?
- a. Jurassic    c. Cretaceous
  - b. Pre-Cambrian    d. Cambrian
56. Certain substances are classified as water pollutants, others as air pollutants, and still others as land pollutants. Which of the following pollutes all three of our environments?
- a. Fluorocarbons    c. Acid Train
  - b. Smog    d. Ozone
57. What is the name of the phenomenon that causes the accumulation of heat in the lower atmosphere because of the absorption of longwave radiation from the Earth's surface?
- a. Climate change    c. Greenhouse effect
  - b. Global warming    d. Solar heat
58. The lag time between the precipitation period and peak discharge period of a river is

- a. increased by urbanization
- b. decreased urbanization
- c. Shorter for a large drainage basin than for a small one.
- d. Depends upon the hydraulic heads.

59. Which is not true about non-renewable resources?

- a. Their exploitation and use will eventually lead to their exhaust.
- b. These resources take millions of years to form.
- c. They cannot be stored for future use.
- d. They are finite or non-sustainable.

60. It refers to extreme warming of the central and eastern Pacific.

- a. Winter
- b. La Niña
- c. El Niño
- d. Tropical Storm



## II. ENGINEERING

**Instruction.** Please encircle the most appropriate answer.

1. Identify the vectors.

I. Speed

II. Velocity

III. Displacement

IV. Time

V. Distance

a. I and IV

c. II and III

b. I, II, and IV

d. II, III, and V

2. A car starts moving 10 m to the left of a *Narra* tree and stops 5 m to the right of the tree. What is the displacement of the car?

a. 10 m

c. 60 m

b. 40 m

d. 50 m

3. Calculate the average velocity at a particular time interval of a person if he moves 7m left in 4 s and 18 m right in 6s.

a. 5.5 m

c. 5.5 s

b. 5.5 m/s

d. 11 m/2 s

For items 4 and 5, refer to the situation below.

A race car accelerates uniformly from 18.5 m/s to 46.1 m/s in 2.47 seconds.

4. Determine the acceleration of the car.

a. 10.3 m/s<sup>2</sup>

c. 9.7 m/s<sup>2</sup>

b. 11.2 m/s<sup>2</sup>

d. 6.5 m/s<sup>2</sup>

5. Determine the traveled distance of the car.

a. 79.8 m

c. 65.9 m

b. 89.5 m

d. 55.7 m

6. An object is launched at a velocity of 20 m/s in a direction making an angle of 25° upward with the horizontal. What is the maximum height reached by the object?

a. 8.74 m

c. 4.36 m

b. 5.97 m

d. 3.64 m

For items 7-9, determine which Newton's Law of Motion is being pertained.

7. An object at rest stays at rest and an object in motion stays in motion with the same speed and the same direction unless acted upon by an unbalanced force.

a. Newton's First Law of Motion

b. Newton's Second Law of Motion

c. Newton's Third Law of Motion

d. None of the above

8. The velocity of an object as produced by a net force is directly proportional to the magnitude of the net force, in the same direction as the net force, and inversely proportional to the mass of the object.

a. Newton's First Law of Motion

b. Newton's Second Law of Motion

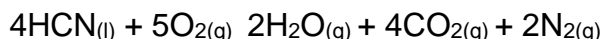
c. Newton's Third Law of Motion

d. None of the above

9. When two bodies interact, they apply forces to one another that are equal in magnitude and opposite in direction.
- Newton's First Law of Motion
  - Newton's Second Law of Motion
  - Newton's Third Law of Motion
  - None of the above
10. A rope is used to pull a 2.89-kg bucket of water out of a deep well. What is the acceleration of the bucket when the tension in the rope is 30.2 N?
- 0.58 m/s<sup>2</sup>, downward
  - 0.65 m/s<sup>2</sup>, upward
  - 0.95 m/s<sup>2</sup>, upward
  - 0.65 m/s<sup>2</sup>, downward
11. In an \_\_\_\_\_ cell, the electrode at which the electrons enter the solution is called cathode.
- Electrolytic
  - Electric
  - Voltaic
  - Galvanic
12. Which of the following is NOT a state property?
- Enthalpy
  - Pressure
  - Temperature
  - Work
13. Which is true if  $\Delta H = -95 \text{ J}$ ?
- The system is gaining 95 J, while the surroundings are losing 95 J.
  - The system is losing 95 J, while the surroundings are gaining 95 J.
  - The system is losing -95 J, while the surroundings are gaining 95 J.
  - Both the system and the surroundings are losing 95 J.
14. How can energy be transferred to or from a system?
- Energy can be transferred only as heat.
  - Energy can be transferred only as work.
  - Energy can be transferred as heat or work.
  - Energy can only be transferred as potential energy converted to kinetic energy.
15. Branch of chemistry that deals with the interconversion of electric energy and chemical energy.
- Thermodynamics
  - Electrochemistry
  - Electrolytic
  - Electrolysis
16. Which of the following laws is applicable for the behavior of perfect gas?
- Charles
  - Gay-Lussac
  - Boyle
  - All of the above
17. Given the  $E^\circ$  for the following half-reactions:
- $$\text{Cu}^+ + \text{e}^- \rightarrow \text{Cu}^\circ \quad E^\circ_{\text{red}} = 0.52 \text{ V}$$
- $$\text{Cu}^{2+} + 2\text{e}^- \rightarrow \text{Cu}^\circ \quad E^\circ_{\text{red}} = 0.34 \text{ V}$$
- What is  $E^\circ$  for the reaction:
- $$\text{Cu}^+ \rightarrow \text{Cu}^{2+} + \text{e}^-$$
- $E^\circ_{\text{cell}} = 0.52 \text{ V}$
  - $E^\circ_{\text{cell}} = -0.34$
  - $E^\circ_{\text{cell}} = 0.34$
  - $E^\circ_{\text{cell}} = 0.18 \text{ V}$
- For items 18 and 19, use the table.
- | Compound             | $S^\circ [\text{J}/(\text{mol} \cdot \text{K})]$ | $\Delta H_f \text{ kJ/mol}$ |
|----------------------|--|-----------------------------|
| HCN (l)              | 94.1   | 151.0                       |
| O <sub>2</sub> (g)   | 205.0  | 0                           |
| H <sub>2</sub> O (g) | 189.0  | -242.0                      |

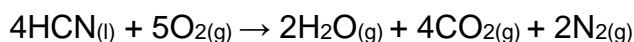
CO <sub>2</sub> (g)	214	-393.5
N <sub>2</sub> (g)	192	0

18. Calculate the  $\Delta S$  using the table.



- a. + 216 J/mol\*K      c. + 216.6 J/mol\*K  
b. - 216.6 J/mol\*K      d. - 216 J/mol\*K

19. Calculate  $\Delta H_f$  using the table.



- a. - 1254 kJ/ mol      c. - 2354 kJ/ mol  
b. - 3269 kJ/ mol      d. - 2662 kJ/ mol

20. How much in joules is done when a piston expands from a volume of 13.27 liters to 76.55 liters against a pressure of 14.89 atm?

- a. 95450 J      c. - 95450 J  
b. - 942.2 L atm      d. 942.2 L atm

21. The area of a square field is 24200 sq m. How long will a lady take to cross the field diagonally at the rate of 6.6 km/hr?

- a. 3 minutes      c. 2.4 minutes  
b. 2 minutes      d. 2 minutes 40 seconds

22. The circumference of the front wheel of a cart is 30 ft long and that of the back wheel is 36 ft long. What is the distance traveled by the cart, when the front wheel has done five more revolutions than the rear wheel?

- a. 20 ft      c. 750 ft  
b. 25 ft      d. 900 ft

23. If the sides of a triangle measure 72, 75, and 21, what is the measure of its radius?

- a. 37.5      c. 9  
b. 24      d. 15

24. A 5 cm cube is cut into as many 1 cm cubes as possible. What is the ratio of the surface area of the larger cube to that of the sum of the surface areas of the smaller cubes?

- a. 1:6      c. 1:25  
b. 1:5      d. 1:125

25. If each interior angle of a regular polygon is 150 degrees, then it is a/an \_\_\_\_\_.

- a. Octagon      c. Dodecagon  
b. Decagon      d. Tetrahedron

26. Four horses are tethered at 4 corners of a square field of side 70 meters so that they can just about reach one another. The area left ungrazed by the horses is:

- a. 1050 sq.m      c. 950 sq.m  
b. 3850 sq.m      d. 1075 sq.m

27. A square sheet of paper is converted into a cylinder by rolling it along its length. What is the ratio of the base radius to the side of the square?

- a.  $\frac{1}{2\pi}$       c.  $\frac{1}{\sqrt{2}\pi}$   
b.  $\frac{\sqrt{2}}{\pi}$       d.  $\frac{1}{\pi}$

28. The surface area of the three coterminal faces of a cuboid is 6, 15, and 10 sq. cm respectively. Find the volume of the cuboid.

- a. 30 cc                      c. 40 cc  
b. 20 cc                      d. 35 cc

29. If the diagonal and the area of a rectangle are 25 m and 168 m<sup>2</sup>, what is the length of the rectangle?

- a. 17 m                      c. 12 m  
b. 31 m                      d. 24 m

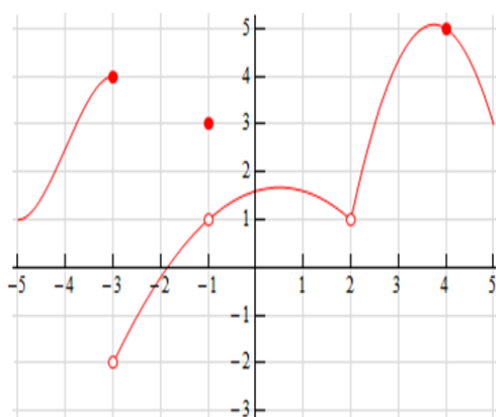
30. A 4 cm cube is cut into 1 cm cubes. What is the percentage increase in the surface area after cutting?

- a. 4%                      c. 75%  
b. 300%                      d. 400%

31. Evaluate the function  $f(x) = \sqrt{3+x} - \frac{4}{x+1}$ , where  $x = \left(\frac{1}{x} - 1\right)$ .

- a.  $\sqrt{2 + \frac{1}{2}} - 4$                       c.  $\sqrt{2 + \frac{1}{2}} - x$   
b.  $\sqrt{2 + \frac{1}{2}} - 4x$                       d.  $\sqrt{3 + \left(\frac{1}{x} - 1\right)} - \frac{4}{\left(\frac{1}{x} - 1\right) + 1}$

For items 32 and 33, refer to the graph below.



32. Determine the value of  $f(a)$ , where  $a = -3$

a. 3                      c. 4  
b. does not exist                      d. -4

33. Determine the value of  $\lim_{x \rightarrow a} f(x)$ .

a. does not exist                      c. 0  
b. 4                      d. -3

34. Find the derivative of  $h(x) = \frac{4x^3 - 7x + 8}{x}$ .

- a.  $h'(x) = 8x - 8x^{-2}$   
b.  $h'(x) = 8x + 8x^{-2}$   
c.  $h'(x) = 4x - 8x^{-2}$   
d.  $h'(x) = 4x - 4x^{-2}$

35. Differentiate:  $f(x) = \sinh(x) + 2 \cosh(x) - \operatorname{sech}(x)$ .

- a.  $f'(x) = 2 \cosh(x) + 2 \sinh(x) + \operatorname{sech}(x) \tanh(x)$   
b.  $f'(x) = \sinh(x) + 2 \cosh(x) + \operatorname{sech}(x) \tanh(x)$   
c.  $f'(x) = \cosh(x) + 2 \sinh(x) + \operatorname{sech}(x) \tanh(x)$   
d.  $f'(x) = 2 \sinh(x) + \cosh(x) + \operatorname{sech}(x) \tanh(x)$

36. Find the tangent line to  $f(x) = \tan(x) + 9 \cos(x)$  at  $x = \pi$ .

- a.  $y = \pi - 9$                       c.  $y = x - \pi - 9$   
b.  $y = -9 + x - \pi$                       d.  $y = x - \pi$

37. Use L'Hôpital's Rule to evaluate

$$\lim_{z \rightarrow 0} \frac{\sin(2z) + 7z^2 - 2z}{z^2(z+1)^2}$$

- a. 5                      c.  $\frac{14}{2}$   
b. 8                      d. 7

38. Use L'Hôpital's Rule to evaluate  $\lim_{x \rightarrow \infty} [e^x +$

$$x]^{\frac{1}{x}}.$$

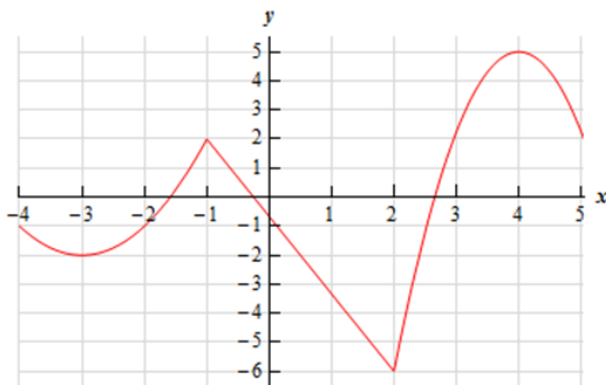
- a.  $e$                       c.  $\infty$   
b.  $\pi$                       d.  $\frac{1}{x}$

39. Compute the differential for  $f(x) = x^2 - \sec(x)$ . 43. Integrate the equation

$\sec(x)$ .

- a.  $df = (x^2 - \sec(x) \tan(x))dx$
- b.  $df = (2x - \sec(x) \tan(x))dx$
- c.  $df = (x - \sec(x) \tan(x))dx$
- d.  $df = (-\sec(x) \tan(x))dx$

40. Below is the graph of some functions,  $f(x)$ . Identify all the related maximum of the function.



- a. 4, 5
- b. 2, -6
- c. -1, 2
- d. -3, -2

41. Evaluate:  $\int 4x \cos(2 - 3x) dx$

- a.  $-\frac{4}{3}x \sin(2 - 3x) + \frac{4}{3}\cos(2 - 3x) + C$
- b.  $-\frac{4}{3}x \sin(2 - 3x) + \frac{4}{9}\cos(2 - 3x) + C$
- c.  $-\frac{4}{3}x \sin(2 - 3x) + \frac{4}{9}\cos(2 - 3x)$
- d.  $\frac{4}{3}x \sin(2 - 3x) + \frac{4}{9}\cos(2 - 3x) + C$

42. Evaluate:  $\int (4x^3 - 9x^2 + 7x + 3)e^{-x} dx$

- a.  $-e^{-x}(4x^3 + 3x^2 + 13x + 16) + C$
- b.  $e^{-x}(4x^3 + 3x^2 + 13x + 16)$
- c.  $e^{-x}(4x^3 + 3x^2 + 13x + 16) + C$
- d.  $-e^{-x}(4x^3 + 3x^2 + 13) + C$

$\int \sin^3\left(\frac{2}{3}x\right) \cos^4\left(\frac{2}{3}x\right) dx.$

- a.  $\frac{3}{14}\cos^7\left(\frac{2}{3}x\right) - \frac{3}{10}\cos^5\left(\frac{2}{3}x\right)$
- b.  $\frac{3}{14}\cos^7\left(\frac{2}{3}x\right) - \frac{3}{10}\cos^5\left(\frac{2}{3}x\right) + C$
- c.  $\frac{3}{14}\cos^7\left(\frac{2}{3}x\right) - \frac{3}{10}\cos^5\left(\frac{2}{3}x\right) + C$
- d.  $\frac{3}{14}\cos^7\left(\frac{2}{3}x\right) + \frac{3}{10}\cos^5\left(\frac{2}{3}x\right) + C$

44. Evaluate:  $\int \frac{2+7\sin^3(z)}{\cos^2(z)} dz$

- a.  $2 \tan(z) + 7 \frac{1}{\cos(z)} + 7 \cos(z) + C$
- b.  $2 \tan(z) + 7 \sec(z) + 7 \cos(z) + C$
- c.  $2 \tan(z) + 7 \frac{1}{\cos(z)} + 7 \cos(z)$
- d.  $2 \tan(z) + 7 \sec(z) + 7 \cos(z)$

45. Evaluate:  $\int \frac{7}{2+\sqrt{x-4}} dx$

- a.  $14(\sqrt{x-4}+2) - 28 \ln|\sqrt{x-4}+2|$
- b.  $14(\sqrt{x-4}+2) - 28 \ln|\sqrt{x-4}+2| + C$
- c.  $14(\sqrt{x-4}+2) - 28 \ln \sqrt{x-4}+2 + C$
- d.  $14(\sqrt{x-4}+2) - 28 \ln|\sqrt{x-4}+2| + C$

For items 46 and 47, determine if the integral converges or diverges.

46.  $\int_0^\infty (1+2x)e^{-x} dx$

- a. The integral converges.
- b. The integral diverges.
- c. Both A and B.
- d. None of the above

47.  $\int_{-5}^1 \frac{1}{10+2z} dz$

- a. The integral converges.
- b. The integral diverges.
- c. Both A and B.

d. None of the above

48. Determine the value of the function

$$\int_2^{\infty} \frac{9}{(1-3z)^4} dz.$$

a.  $\frac{1}{9}$

c.  $\frac{1}{15}$

b.  $\frac{1}{25}$

d.  $\frac{1}{125}$

49. Evaluate:  $\int 6 \tan^{-1}\left(\frac{8}{w}\right) dw$

a.  $6w \tan^{-1}\left(\frac{8}{w}\right) + 24 \ln|w^2 + 64| + C$

b.  $6w \tan^{-1}\left(\frac{8}{w}\right) + 24 \ln|w^2 + 64|$

c.  $6w \cos^{-1}\left(\frac{8}{w}\right) + 24 \ln|w^2 + 64| + C$

d.  $6w \tan^{-1}\left(\frac{8}{w}\right) + 16 \ln|w^2 + 64| + C$

50. Evaluate:  $\int e^{2z} \cos\left(\frac{1}{4}z\right) dz$

a.  $\frac{32}{65} e^{2z} \cos\left(\frac{1}{4}z\right) + \frac{4}{65} e^{2z} \sin\left(\frac{1}{4}z\right)$


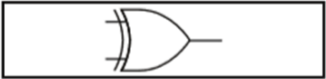

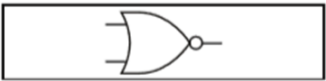
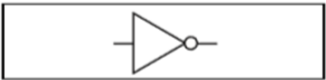
b.  $\frac{32}{65} e^{2z} \cos\left(\frac{1}{4}z\right) + \frac{4}{65} e^{2z} \sin\left(\frac{1}{4}z\right)$

c.  $\frac{32}{65} e^{2z} \cos\left(\frac{1}{4}z\right) + \frac{4}{65} e^{2z} \sin\left(\frac{1}{4}z\right) + C$

d.  $\frac{32}{65} e^{2z} \cos\left(\frac{1}{4}z\right) + e^{2z} \sin\left(\frac{1}{4}z\right) + C$

### III. INFORMATION AND COMMUNICATIONS TECHNOLOGY

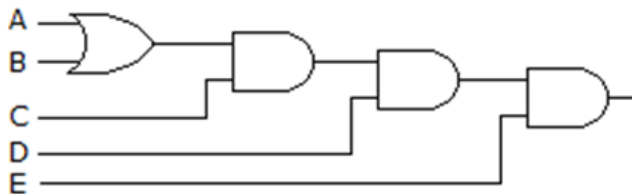
**Instruction.** Please encircle the most appropriate answer.

1. Convert the binary  $110100100101_2$  into hexadecimal.  
a.  $D25_{16}$                       c.  $D47_{16}$   
b.  $D27_{16}$                       d.  $D45_{16}$
  2. Convert the hexadecimal  $56_{16}$  into decimal.  
a.  $86_{10}$                       c.  $88_{10}$   
b.  $84_{10}$                       d.  $94_{10}$
  3. Convert the decimal  $1001001_{10}$  into octal.  
a.  $111_8$                       c.  $73_8$   
b.  $3643051_8$                       d.  $1342011_8$
  4. Convert the octal  $420_8$  to binary.  
a.  $100001000_2$                       c.  $100010000_2$   
b.  $100100000_2$                       d. None of the above
  5. What is the sum of  $1001_{10} + 1001_2$  in decimal?  
a.  $1012_{10}$                       c.  $2002_{10}$   
b.  $1010_{10}$                       d.  $10010_{10}$
  6. Which of the following has the highest value?  
a.  $105127_8$                       c.  $35415_{10}$   
b.  $8A57_{16}$                       d.  $1000101010010101_2$
  7. Convert the result of  $105_{10} + 101_8$  in hexadecimal  
a.  $95_{16}$                       c.  $AA_{16}$   
b.  $AC_{16}$                       d.  $94_{16}$
  8.  $62.75_{10}$  When converted to its binary form is?  
a.  $111100.11_2$                       c.  $111010.11_2$   
b.  $111011.11_2$                       d.  $111110.11_2$
- For items 9-12, refer to the diagram below:
- Logic Gate Symbol**
1. 
  2. 
  3. 
  4. 
  5. 
9. Which of the following symbols represent the NOT gate?  
a. 1                      c. 3  
b. 4                      d. 5
  10. Which of the following symbols represent the NOR gate?  
a. 1                      c. 3  
b. 4                      d. 2
  11. Which of the following symbols represent the XOR gate?  
a. 2                      c. 3  
b. 4                      d. 5

12. Which of the following symbols represent the AND gate?

- a. 1
- b. 2
- c. 3
- d. 5

13. Derive the Boolean expression for the logic circuit shown below:



- a.  $C(A + B) DE$
- b.  $[C(A + B) D + E]$
- c.  $[C(A + B) + D] E$
- d.  $ABCDE$

14. One of De Morgan's theorems states that  $\overline{X + Y} = \bar{X} \cdot \bar{Y}$ . Simply stated, this means that logically there is no difference between:

- a. A NOR and an AND gate with inverted inputs.
- b. A NAND and an OR gate with inverted inputs.
- c. An AND and a NOR gate with inverted inputs.
- d. A NOR and a NAND gate with inverted inputs.

15. A truth table for the SOP expression  $AB\bar{C} + \bar{A}BC$  has how many input combinations

- a. 1
- b. 2
- c. 4
- d. 8

16. It is the lowest level of computer languages.

- a. Machine Language
- b. High-Level Language

- c. Low-Level Language
- d. Assembly Language

17. What is the language that only a computer understands

- a. Machine Language
- b. High-Level Language
- c. Low-Level Language
- d. Assembly Language

18. This is a statement that does a series of steps in a continuum until further conditions are met.

- a. Format Statement
- b. Loop Statement
- c. Case Statement
- d. Condition Statement

19. When the variable used in the program is a whole number, the variable is stored as \_\_\_\_\_.

- a. Fixed String
- b. Negative Whole Numbers
- c. Integers
- d. Positive Whole Numbers

20. This statement is used if you initiate a process only when specific conditions are made.

- a. If-Then Statement
- b. Then-Else Statement
- c. Else-One Statement
- d. If-Else Statement

21. A group of all special characters such as digits and letters is classified as



- a. Even Numbers      c. Negative Numbers
- b. Strings              d. Odd Numbers

- a. Flowchart              c. Pseudocode
- b. Program                d. Syntax

22. Program style and must be written in \_\_\_\_\_.

- a. A well-structured manner
- b. Easy modification format
- c. Easily understandable
- d. All of the above

23. A name that has some special meaning and significance for a programmer is called

- a. Reserved words      c. Files
- b. Changing words      d. Data Array

For items 24 and 25, refer to the pseudocode below:

```

Int      counter      =      1;
While    (counter      <=      3){
    Int second_counter = counter;
    WHILE(second_counter >0){
        PRINT(counter)
        second_counter--
    }
    PRINT("
}
  
```

24. How many iterations will the first While loop will run?

- a. 4 iterations              c. 3 iterations
- b. 5 iterations              d. 2 iterations

25. What will be the output of the following pseudo-Code?

- a. 1 2 3 4 5 6              c. 1 1 2 2 3 3
- b. 1 2 2 3 3 3              d. None of the above

26. When an algorithm is written in the form of a programming language, it becomes a:

27. An artificial and informal language that helps programmers to develop algorithms is called

- a. Instruction code      c. Pseudocode
- b. Algo-code              d. Qualicode

28. Specifying the order in which statements are to be executed in a program is called \_\_\_\_\_.

- a. Program control      c. Program counter
- b. Program order        d. Program flow

29. The worst-case complexity of the linear search algorithm is

- a.  $O(n)$                       c.  $O(n^2)$
- b.  $O(\log n)$                 d.  $O(n \log n)$

30. The operation of processing each element in the list is known as


- a. Traversal                c. Merging
- b. Inserting                d. Sor

31. The smallest element of an array's index is called its \_\_\_\_\_.

- a. extraction              c. lower bound
- b. range                    d. upper bound

32. There are 6 equally spaced points A, B, C, D, E, and F marked on a circle with radius R. How many convex heptagons of distinctly different areas can be drawn using these points as vertices?

- a.  $7! \cdot 6$                       c.  $7!$
- b.  ${}^7C_5$                         d. Same area

33. There are 6 equally spaced points A, B, C, D, E, and F marked on a circle with radius R. How many convex heptagons of distinctly different areas can be drawn using these points as vertices?
- a.  $3! \cdot 12C_5$                       c.  $15! \cdot 4$   
b.  $^{16}C_4 \cdot ^4C_4$                       d.  $^{15}C_4 \cdot ^5C_3 \cdot 7!$
34. How many ways are there to arrange 7 chocolate biscuits and 12 cheesecake biscuits into a row of 19 biscuits?
- a. 52347                      c. 87658  
b. 50388                      d. 24976
35. If a, b, c, d, and e are five natural numbers, then find the number of ordered sets(a, b, c, d, e) possible such that  $a + b + c + d + e = 75$ .
- a.  $^{65}C_5$                       c.  $^{72}C_7$   
b.  $^{58}C_6$                       d.  $^{74}C_4$
36. There are 15 people on a committee. How many ways are there to group these 15 people into 3, 5, and 4?
- a. 846                      c. 658  
b. 2468                      d. 1317
37. How many ways are there to divide 4 Indian countries and 4 China countries into 4 groups of 2 each such that at least one group must have only Indian countries?
- a. 6                      c. 12  
b. 45                      d. 76
38. Disk Access Time is measured in \_\_\_\_\_.  
a. Nanoseconds                      c. Microseconds  
b. Milliseconds                      d. Picoseconds
39. Cassette tapes are an example of what kind of storage?  
a. Secondary                      c. Volatile  
b. Primary                      d. Tertiary
40. A DVD is \_\_\_\_\_.  
a. Optical Disk                      c. Solid State Storage  
b. Output Device                      d. Hard Disk
41. File type can be represented by:  
a. File Name                      c. File Identifier  
b. File Extension                      d. File Type
42. Time to move the read/write heads to a spot on the medium is defined as the \_\_\_\_\_.  
a. Read time                      c. Seek time  
b. Transfer time                      d. Average access time
43. File Mapping is managed by \_\_\_\_\_.  
a. File Metadata                      c. Virtual Memory  
b. Page Tables                      d. File System
44. Private network which uses storage protocol rather networking protocol is \_\_\_\_\_.  
a. Storage Area Network  
b. Local Area Network  
c. Wide Area Network  
d. Personal Area Network
45. The  symbol in flowcharts denote \_\_\_\_\_.  
a. Input/Output                      c. Terminal  
b. Flow                      d. Decision

46. Actual Instructions in Flowcharting are represented in?

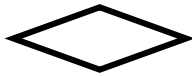
- a. Circles
- b. Boxes
- c. Arrows
- d. Lines

47. A flowchart that outlines the main segments of a program.

- a. Queue
- b. Macro
- c. Micro
- d. Union

48. A detailed flowchart is called

- a. Stack
- b. Macro
- c. Micro
- d. Union

49. The  symbol denotes \_\_\_\_\_.  
a. Decision                      c. Initialization  
b. Initiation                      d. Input/Output

50. Which of the following is not an advantage of a flowchart

- a. Better Communication
- b. Efficient Coding
- c. Systematic Testing
- d. Improper Documentation

# **JLSS SAMPLE EXAMINATION – ANSWER KEY**

## **PART 1, 2.A, and 2.**

**Part 1. Logical Reasoning**

<u>Spatial Reasoning</u>	<u>Mechanical Reasoning</u>	<u>Verbal Reasoning</u>
1. C	1. A	1. C
2. B	2. B	2. C
3. B	3. C	3. C
4. D	4. A	4. B
5. A	5. C	5. B
6. C	6. D	6. A
7. B	7. B	7. B
8. B	8. C	8. B
9. A	9. C	9. A
10. B	10. A	10. C
11. B	11. D	11. B
12. B	12. D	12. C
13. C	13. B	13. B
14. C	14. D	14. C
15. A	15. C	15. A

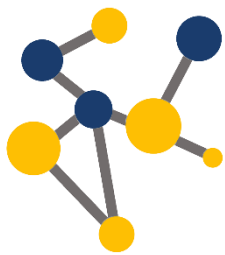
**Part 2.A. Power Test**

<u>English</u>	<u>Mathematics</u>	<u>Teaching Aptitude</u>
1. B	21. B	1. B
2. C	22. C	2. D
3. D	23. B	3. C
4. C	24. B	4. A
5. C	25. C	5. C
6. D	26. D	6. A
7. A	27. C	7. B
8. A	28. D	8. A
9. A	29. C	9. D
10. B	30. A	10. C
11. B	31. A	11. B
12. B	32. D	12. D
13. A	33. C	13. A
14. B	34. D	14. D
15. A	35. E	15. C
16. C	36. B	16. A
17. B	37. A	17. D
18. B	38. A	18. A
19. A	39. B	19. B
20. A	40. B	20. B
		21. C
		22. A
		23. C
		24. B
		25. D
		26. B
		27. C
		28. A
		29. D
		30. D
		31. B
		32. C
		33. D
		34. B
		35. B
		36. A
		37. A
		38. C
		39. D
		40. B
		41. C
		42. B
		43. D
		44. A
		45. C
		46. C
		47. D
		48. B
		49. A
		50. C

**Part 2.B. Power Test**

<u>Science</u>		<u>Engineering</u>		<u>ICT</u>	
1. D	31.C	1. C	26.A	1. A	26.B
2. B	32.D	2. C	27.A	2. A	27.C
3. B	33.A	3. B	28.A	3. B	28.A
4. C	34.B	4. B	29.D	4. C	29.A
5. C	35.A	5. A	30.B	5. B	30.A
6. D	36.D	6. D	31.D	6. D	31.C
7. B	37.A	7. A	32.C	7. C	32.D
8. A	38.B	8. D	33.A	8. D	33.D
9. C	39.B	9. C	34.A	9. D	34.B
10.C	40.B	10.B	35.C	10.B	35.D
11.D	41.C	11.A	36.C	11.A	36.D
12.B	42.A	12.D	37.D	12.C	37.A
13.B	43.B	13.B	38.A	13.A	38.B
14.C	44.D	14.C	39.B	14.A	39.A
15.C	45.D	15.B	40.A	15.D	40.A
16.C	46.D	16.D	41.B	16.A	41.B
17.C	47.B	17.D	42.A	17.A	42.C
18.B	48.D	18.C	43.C	18.B	43.A
19.A	49.C	19.D	44.B	19.C	44.A
20.A	50.A	20.C	45.D	20.D	45.C
21.C	51.D	21.B	46.A	21.B	46.B
22.C	52.B	22.D	47.B	22.D	47.B
23.C	53.A	23.C	48.D	23.A	48.C
24.C	54.C	24.B	49.A	24.D	49.A
25.A	55.D	25.C	50.C	25.D	50.D
26.C	56.C				
27.A	57.C				
28.C	58.A				
29.D	59.C				
30.B	60.C				

**END.**



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