

ENTRANCE EXAMINATION – 2016

Ph.D. (Cognitive Science)

Marks: 75

Time: 2.00 hrs.

Hall Ticket No. _____

1. Write your Booklet Code and Hall Ticket Number in the OMR Answer Sheet given to you. Also write the Hall Ticket Number in the space provided above.
2. Read carefully the following instructions:
 - a. This Question paper has Two Sections: Part- I and Part- II.
 - b. Part I (Ques. No. 1 to 35) is to be answered by all candidates. There are two sets of questions for part II (Ques. No. 36 to 75) corresponding to the two streams. **Answer one and only the set corresponding to your stream of interest i.e. either Neuroscience or Cognitive Science.**
 - c. The stream name and code is mentioned in the beginning of each set. **Mark the booklet code for the stream in the OMR sheet. Booklet code A for 'Neuroscience' stream. Booklet code B for 'Cognitive Science' stream.**
 - d. Part - I has 35 and Part - II has 40 objective type questions of one mark each.
 - e. **There is negative marking for all the questions in parts I and II. Each wrong answer carries -0.33 marks.**
 - f. Answers are to be marked on the OMR answer sheet following the instructions provided there upon.
 - g. Calculators are permitted. Logarithmic tables are not allowed
 - h. Hand over the OMR answer sheet at the end of the examination to the Invigilator.
 - i. No additional sheets will be provided. Rough work can be done in the question paper itself / space provided at the end of the booklet.

PART I

A family consists of seven members P, Q, R, S, T, U, V. There are three married couples. Q is an engineer and father of T. U is grandfather of T and is a contractor. R is daughter-in-law of S who is a nurse by occupation. V is T's uncle who is a professor. There is one student, one home maker, and one doctor in the family. The student is unmarried and R is the sister-in-law of Q. Answer questions 1 to 5.

1. Who is R's husband?

- a. V
- b. Q
- c. T
- d. R

2. Who is T's aunt?

- a. S
- b. P
- c. U
- d. None of the above

3. What is the profession of P?

- a. Home maker
- b. Nurse
- c. Doctor
- d. either (a) or (c)

4. Which of the following are married couples?

- a. PV, QR, US
- b. VT, PQ, US
- c. PQ, RV, US
- d. None of the above

5. Which of the following is definitely a group of female members?

- a. PRST
- b. PRT
- c. PRS
- d. None of the above

Ocean water plays an indispensable role in supporting life. The great ocean basins hold about 300 million cubic miles of water. From this vast amount, about 80,000 cubic miles

of water are sucked into the atmosphere each year by evaporation and returned by precipitation and drainage to the ocean. More than 24,000 cubic miles of rain descend annually upon the continents. This vast amount is required to replenish the lakes and streams, springs and water tables on which all flora and fauna are dependent. Thus, the hydrosphere permits organic existence.

The hydrosphere has strange characteristics because water has properties unlike those of any other liquid. One anomaly is that water upon freezing expands by about 9 percent, whereas most liquids contract on cooling. For this reason, ice floats on water bodies instead of sinking to the bottom. If the ice sank, the hydrosphere would soon be frozen solidly, except for a thin layer of surface melt water during the summer season. Thus, all aquatic life would be destroyed and the interchange of warm and cold currents, which moderates climate, would be notably absent.

Another outstanding characteristic of water is that water has a heat capacity which is the highest of all liquids and solids except ammonia. This characteristic enables the oceans to absorb and store vast quantities of heat, thereby often preventing climatic extremes. In addition, water dissolves more substances than any other liquid. It is this characteristic which helps make oceans a great storehouse for minerals which have been washed down from the continents. In several areas of the world these minerals are being commercially exploited. Solar evaporation of salt is widely practiced, potash is extracted from the Dead Sea, and magnesium is produced from sea water along the American Gulf Coast. Now answer the questions 6-9.

6. The author's main purpose in this passage is to
 - a. describe the properties and uses of water
 - b. illustrate the importance of conserving water
 - c. explain how water is used in commerce and industry
 - d. reveal the extent of the earth's ocean masses
7. According to the passage, fish can survive in the oceans because
 - a. they do not need oxygen
 - b. ice floats
 - c. evaporation and condensation create a water cycle
 - d. there are currents in the oceans
8. According to the passage, the hydrosphere is NOT
 - a. responsible for all forms of life
 - b. able to modify weather
 - c. source of natural resources
 - d. in danger of freezing over
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10. The three angles of a triangle are in the ratio of 3:2:1. What is the largest angle in the triangle?
- 90
 - 100
 - 60
 - 120
11. Soni is in India and she walks towards North at a speed of 2km/hr for 2hrs and then East at 3km/hr for 1hr. What is her displacement from the starting point?
- 7 Km North
 - 5 Km North
 - 1 Km North-East
 - 7 Km North-East
12. What does the number 0110 in binary system (a number system in base 2) stand for in the decimal system?
- 12
 - 220
 - 8
 - 10
13. Synonym of hurtle is:
- Speed
 - Embroid
 - Reduce
 - Pain
14. Look at this series: 36, 34, 30, 28, 24, ... What number should come next?
- 20
 - 22
 - 23
 - 26
15. Here are some words translated from an artificial language.
- migenlasan means cupboard
lasanpoen means boardwalk
cuopdansa means pullman
- Which word could mean "walkway"?
- Poenmigen
 - Cuopeisel
 - Lasandansa
 - Poenforc

16. The film director wants an actress for the lead role of Lucy who perfectly fits the description that appears in the original screenplay. He is not willing to consider actresses who do not resemble the character as she is described in the screenplay, no matter how talented they are. The screenplay describes Lucy as an average-sized, forty something redhead, with deep brown eyes, very fair skin, and a brilliant smile. The casting agent has four actresses in mind.

Actress #1 is a stunning red-haired beauty who is 5'9" and in her mid-twenties. Her eyes are brown and she has an olive complexion.

Actress #2 has red hair, big brown eyes, and a fair complexion. She is in her mid-forties and is 5'5".

Actress #3 is 5'4" and of medium build. She has red hair, brown eyes, and is in her early forties.

Actress #4 is a blue-eyed redhead in her early thirties. She's of very slight build and stands at 5'.

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

17. A, B, C and D play a game of cards. A says to B. "If I give you 8 cards, you will have as many as C has and I shall have 3 less than what C has. Also if I take 8 cards from C, I shall have twice as many as D has." If B and D together have 50 cards, how many cards have A got?

- a. 35
- b. 37
- c. 38
- d. 40

18. Sam's sports card collection contains football, baseball and basketball cards. If the ratio of football to baseball cards is 3 to 2 and the ratio of baseball to basketball cards is 3 to 1, what is the ratio of football to basketball cards?

- a. 3:1
- b. 3:3
- c. 9:2
- d. 6:3

19. Who is the current president of Myanmar?

- a. Htin Kyaw
- b. Aung San Suu Kyi
- c. Thein Sein
- d. Maung Maung

20. A car travelling with $\frac{5}{7}$ of its actual speed covers 42 km in 1 hr 40 min 48 sec. Find the actual speed of the car in km/h.

- a. 35

- b. 30
 - c. 25
 - d. 17.5
21. The total of the ages of Amar, Akbar and Anthony is 80 years. What was the total of their ages three years ago?
- a. 71
 - b. 72
 - c. 74
 - d. 77
22. Find the odd one out
- a. Keyboard
 - b. Mouse
 - c. Microphone
 - d. Loud speaker
23. Chapters : Book ::
- a. Cookbooks : Recipe
 - b. Articles : Journal
 - c. Editions : Newspaper
 - d. Magazines : Subscription
24. Which of the following is not a chemical reaction?
- a. Dissolution of salt in water
 - b. Combustion of petrol
 - c. Photosynthesis
 - d. Polymerization
25. There are five books A, B, C, D and E placed on a table. If A is placed below E, C is placed above D, B is placed below A and D is placed above E, then which of the following books touches the surface of the table?
- a. E
 - b. B
 - c. D
 - d. A
26. What is the missing term in the following series: JQ, LO, OL, __, XC?
- a. SK
 - b. RH
 - c. SH
 - d. RK
27. If A is the brother of B; B is the sister of C; and C is the father of D, how D is related to A?
- a. Brother
 - b. Sister
 - c. Nephew

- d. Can't be determined
28. Which of the following is used in pencils?
- Graphite
 - Silicon
 - Charcoal
 - Phosphorus
29. A number of friends decided to go on a picnic and planned to spend Rs. 96 on eatables. Four of them, however, did not turn up. As a consequence, the remaining ones had to contribute Rs. 4 each extra. The number of those who attended the picnic was
- 8
 - 12
 - 16
 - 24
30. Today is Monday. After 61 days, it will be:
- Monday
 - Tuesday
 - Sunday
 - Saturday
31. In a right triangle, the measure of one of the angles is 49° and the hypotenuse has a length of 50 cm. Which of the following is the nearest approximation to the length, in cm, of the leg opposite to this angle?
- 32.8
 - 57.5
 - 37.7
 - 30.3
32. A hall is 15 m long and 12 m broad. If the sum of the areas of the floor and the ceiling is equal to the sum of the areas of four walls, the volume of the hall is:
- 720
 - 900
 - 1200
 - 1800
33. A clock is started at noon. By 10 minutes past 5, the hour hand has turned through:
- 145 degree
 - 150 degree
 - 155 degree
 - 160 degree
34. What is the difference between the Internet and an intranet?
- One is public, the other is private
 - One is safer than the other
 - One can be monitored, the other can't
 - None of the above

35. In a trapezoid ABCD, the diagonals intersect at E. If area of triangle ABE=72, and area of triangle CDE=50, then area of trapezium ABCD is
- 342
 - 242
 - 184
 - 424

PART II

Stream: Neuroscience (Mark the Booklet code A in OMR sheet)

36. Among the following four statement
- Electric field produces magnetic field
 - Magnetic field produces electric field
 - Electric current produces magnetic field
 - Electric charge produces magnetic field
- I and II are true
 - I and IV are true
 - Only III is true
 - II and III are true
37. If the position of the particle at time is described by coordinates $(\cos(\omega t), \cos(\omega t))$ for some non-zero ω , what is the shape of the trajectory?
- Straight line
 - Parabola
 - Circle
 - Point
38. A tuning fork has a resonant frequency of 330Hz. If it is excited and held to the air column in a tube with a liquid, what is the minimum length of the air column above the water that would give a resonance? (velocity in air = 330m/sec, velocity in the liquid=660m/sec)
- 1m
 - 1/4m
 - 1/2m
 - 2m
39. Two liquids A and B are heated for the same duration under similar conditions. Temperature of A is double that to B at the end of the treatment
- We can say nothing about the heat capacity

- b. A has higher heat capacity than B
c. B has higher heat capacity than A
d. Heat capacity of A and B depends on the time for which the heating was done
40. Which among the options is the differential of the function x ?
a. 1
b. x^2
c. $1/x$
d. e^x
41. What is the value of $g(f(3))$?
i. $f(x) = x^2 + 2$
ii. $g(x) = 4x + 1$
a. 100
b. 45
c. 105
d. 110
42. Which of the following is proportional to the force exerted by a charge q Coulombs charge of Q Coulombs if the mass of the charged bodies are m and M kg respectively?
a. qQ Newtons
b. qQ/mM Newtons
c. qm/QM Newtons
d. $qQmM$ Newtons
43. In the resting state a neuron is at a negative potential with respect to the outside. When stimulated this membrane becomes permeable to Na. Sodium ion flows in because of
a. Electrical potential gradient
b. Diffusion
c. Concentration gradient and electrical potential gradient
d. Diffusion and concentration gradient
44. Solution A contains 20% (by volume) of an acid and another solution B has 55% (by volume) of the same acid. How much of each (A and B) in litres must be taken to obtain 100 liters of a 48% solution of the acid.
a. 20:80
b. 25:75
c. 24:76
d. 30:70
45. If $y = x^5 - 4x - 9$, then d^2y/dx^2 at $x=2$ is
a. 40
b. 8
c. 160
d. 220

46. Which of the following statements are true about the graph of $y = x^2 + 3x + 4$?
- The graph does not cut the x-axis.
 - The graph is entirely above the x-axis.
 - The graph touches the x-axis.
 - The y-axis is the line of symmetry for the graph.
 - The graph cuts the x-axis at two distinct points.
- I, II and V
 - I and II only
 - III alone
 - IV and V alone
47. We cannot see infrared electromagnetic radiation because
- It does not have colour
 - Our eyes do not have appropriate sensors
 - Infrared is heat
 - None of the above
48. A rainbow is formed because the sunlight
- is reflected from dust particles in the atmosphere
 - is reflected from rain drops suspended in the atmosphere
 - is refracted from rain drops suspended in the atmosphere
 - both refracted and internally reflected from rain drop
49. If 12 Volts applied to a resistor caused a current flow of 2 Ampere, what will be the rate of heat generated when 3 Volts is applied?
- 2 Watts
 - 1.5 Watts
 - 4 Watts
 - 1 Watts
50. Composite DNA molecules comprising covalently linked segments from two or more sources are called:
- Cloning vectors
 - Recombinant DNAs
 - Restriction endonucleases
 - Hybridomas
51. When the DNA is denatured, the absorption of UV light by double-stranded DNA will:
- Increase
 - Decrease
 - Remain same
 - Be negligible

52. Some proteins (e.g. Hsp70) interact with partially folded or improperly folded polypeptides, facilitating correct folding pathways. Such proteins are known as:
- Epitope
 - Stress proteins
 - Molecular chaperones
 - Antibodies
53. Which of the following is NOT a stage of polymerase chain reaction?
- Denaturation
 - Hybridization
 - Annealing
 - Extension
54. NA (numerical aperture) is always mentioned on the microscope lenses. Resolution of a microscope
- Varies inversely with NA
 - Varies proportionally with NA
 - is independent of NA value
 - Can't be assessed by NA
55. For the pelleting of the microsomal fraction from a liver homogenate, an ultra-centrifuge is operated at a speed of 40,000 rpm. What is the angular velocity, ω , in radians per second?
- 4188.8
 - 8000
 - 666.67
 - 25120
56. Which of the following technique can be used for detecting protein-protein interactions?
- Yeast two-hybrid
 - EMSA
 - Dialysis
 - Immunoblotting
57. In two-dimensional polyacrylamide gel electrophoresis (PAGE) technique, first dimension and second dimension are based on:
- SDS-PAGE and IEF (iso-electric focusing) technique respectively
 - IEF (iso-electric focusing) and SDS-PAGE technique respectively
 - SDS-PAGE and gradient gel technique respectively
 - SDS-PAGE and cellulose acetate electrophoresis
58. The best method to separate chromosomes from a human neuron by electrophoresis is:
- Capillary electrophoresis
 - Pulsed-field gel electrophoresis

- c. SDS-PAGE
 - d. Two-dimensional PAGE
59. Which technique is used for detecting the level of hormones?
- a. Western blotting
 - b. ELISA
 - c. RT-PCR
 - d. All of the above
60. Of the following structures, state which one is unique to neurons.
- a. Nucleus
 - b. Mitochondria
 - c. Rough endoplasmic reticulum
 - d. Synaptic vesicle
61. Enzymes are the unique catalysts of living system with three distinctive characteristics, except:
- a. Specificity for the reaction
 - b. High catalytic rate
 - c. High capacity for regulation
 - d. Irreversible binding to substrates
62. Which of the following technique is widely used by cognitive neuroscientists?
- a. fMRI
 - b. CT-scan
 - c. Histo-chemistry
 - d. X-rays
63. Molecular weight of protein molecule is generally measured in:
- a. Dalton
 - b. Grams
 - c. Base pairs
 - d. All of the above
64. Which of the following is NOT a neuropeptide?
- a. Oxytocin
 - b. Vasopressin
 - c. Angiotensin
 - d. Dopamine
65. Which of the following is same in both Mitosis and Meiosis?
- a. Both occurs in germ cells
 - b. Duration of prophase is similar in both
 - c. Synapsis of homologous chromosomes occurs

- d. DNA duplication takes place
66. What ions carry the early inward currents during the propagation of nerve impulse?
- Potassium ions
 - Sodium ions
 - Hydrogen ions
 - Bromide ions
67. A drug called strychnine blocks the effects of glycine. Strychnine is of the glycine receptor.
- agonist
 - antagonist
 - allosteric activator
 - competitive activator
68. Which of the following ions is considered to be second messengers in neuronal signaling?
- Chloride ions
 - Calcium ions
 - Potassium ions
 - Sodium ions
69. What physical property of light is most closely related to the perception of colour?
- Wavelength
 - Amplitude
 - Reflection
 - Refraction
70. Which retinal cells are primarily responsible for night time vision?
- Cone cells
 - Rod cells
 - Pyramidal cells
 - Ganglionic cells
71. The brain structure known to be involved in emotion is
- Hippocampus
 - Cingulate gyrus
 - Amygdala
 - Fornix
72. Patch clamp technique is used to
- measure the strength of electrochemical gradient
 - study the properties of extracellular ions
 - study the properties of individual ion channels present on the membrane
 - infuse different kinds of ions into axon

73. In Parkinson's disease, there is a predominant loss of dopaminergic neurons primarily in
- cerebellar cortex
 - substantia nigra
 - cerebral cortex
 - locus coeruleus
74. Resting membrane potential of a biological membrane is close to the Nernst potential for the ions that are
- least abundant
 - most abundant
 - permeable
 - impermeable
75. For recording fast electrophysiological response such as action potential in neurons, one needs a
- Polygraph
 - Cathode ray oscilloscope
 - Spectrophotometer
 - Confocal microscope

PART II**Stream: Cognitive Science (Mark the booklet code B in OMR sheet)**

36. Which brain area produces top down signals for top down control?
- Pre frontal cortex
 - Parietal lobule
 - Amygdala
 - None of the above
37. Which brain region has been implicated for conflict monitoring in stroop task?
- pre-SMA
 - ACC
 - Hypothalamus
 - Insular cortex
38. Which ERP effect is traditionally linked with expectation violation?
- N400
 - P300
 - LRP
 - Both a and b.
39. Which task is widely used to study attentional orienting?
- Stroop task
 - Double step task
 - Stop signal task
 - Posner's cueing task
40. Developmental dyslexia is a disorder of:
- Phonological processing
 - Syntax processing
 - Grapheme processing
 - Both a and c
41. The most common cause of severe intellectual and emotional impairment in older individuals is
- Parkinson's disease
 - Multiple sclerosis
 - Alzheimers' disease
 - Senile psychosis
42. When an individual has difficulty in speaking, the condition is known as
- Wernicke's aphasia
 - Broca's aphasia
 - deep dyslexia
 - Autism
43. _____ is a disorder in which there is lack of awareness in one visual field due to damage to the contralateral side of the brain.
- Visual neglect

- b. Agnosia
 - c. Blindsight
 - d. Hemi motor neglect
44. Which following structure connects Broca's and Wernicke's area?
- a. Corpus callosum
 - b. Sylvian fissures
 - c. Arcuate fasciculus
 - d. sulcus
45. _____ scan measures brain activity through injecting a radioactive glucose that allows observing the brain is functioning.
- a. MRI
 - b. CAT
 - c. FMRI
 - d. PET
46. _____ neurons carry sensory information through afferent nerves in the peripheral nervous system where _____ travel within the central nervous system _____ neurons travel back through the efferent nerves in the peripheral nervous system allowing a response or movement.
- a. Motor; Sensory; interneurons
 - b. Interneurons; Motor; Sensory
 - c. Sensory; Interneurons; Motor
 - d. Motor; Interneurons; Sensory
47. Which part of the brain controls balance and coordinates movements?
- a. Cerebellum
 - b. Thalamus
 - c. Reticular Formation
 - d. Hypothalamus
48. _____ lobes control vision; _____ lobes control audition or hearing.
- a. Occipital; temporal
 - b. Frontal; parietal
 - c. Occipital; frontal
 - d. Occipital; parietal
49. _____ is a relay for all sensory information excluding _____
- a. Hypothalamus; smell
 - b. Pons, smell
 - c. Thalamus, vision
 - d. Thalamus, smell
50. _____ nervous system, which is part of the peripheral nervous system, controls voluntary bodily movements.
- a. Autonomic
 - b. Efferent
 - c. Sympathetic
 - d. Somatic

51. What is SOA?
- Simulated onset asynchrony
 - Sample onset asynchrony
 - Stimulus onset asynchrony
 - Stimulus offset asynchrony
52. Who proposed feature integration theory of attention?
- Broadbent
 - Anne Triesman
 - Daniel Kahneman
 - David Chalmers
53. Perception of stimulus that is below the threshold of awareness is known as:
- Just noticeable difference
 - Differential threshold
 - Subliminal perception
 - Signal detection
54. Broca's area is known to be involved in
- speaking
 - syntactic processing
 - sequential processing
 - all of the above
55. Because it has external features associated with the concept of dog, a wolf is perceived as a dog. This is an example of:
- centration
 - Equilibration
 - object permanence
 - Prototype
56. The school of psychology that emphasizes the "whole is greater than the sum of its parts" and that emphasizes the tendency to integrate separate stimuli into meaningful patterns is the school of
- Behaviorism
 - Gestalt psychology
 - Funtionalism
 - Structuralism
57. Endogenous attentional shift is
- Voluntary
 - Involuntary
 - Both of the above
 - None of the above
58. Foveal vision is limited to
- 1-2 degrees
 - 4-5 degrees
 - 10-12 degrees
 - none of the above

59. The reluctance of attention to return to a location immediately is known as
- inhibition of return
 - inhibition of cause
 - perspective thinking
 - none of the above
60. Which cognitive science discipline is generally thought to be unhelpful in providing an integrated approach to cognition?
- psychology
 - neuroscience
 - computer science
 - none of the above
61. Which of the following brain imaging techniques possess the best temporal resolution
- EEG
 - fMRI
 - PET
 - ERP
62. Basic speech sound are called
- morphemes
 - syllables
 - phonemes
 - syntax
63. Representations used in thinking include
- mnemonics
 - kinesthesia
 - concepts
 - primary fragments of imagination
64. The ability to speak two languages is referred as
- bi-languagism
 - fluency
 - bilingualism
 - none of the above
65. Response time is independent of set size in
- serial search
 - parallel search
 - Change blindness
 - All of the above
66. LRP refers to:
- Lateralized running potential
 - Lateralized readiness potential
 - Lasting readiness potential
 - Late readiness potential

67. What connects left and right hemispheres?
- Medulla oblongata
 - Corpus callosum
 - presulcus gyrus
 - purkinje cells
68. The storage capacity of long term memory is described as:
- Single item
 - About seven items
 - About seven volumes
 - Limitless
69. WAIS is the abbreviation of:
- Weschler Adult Intelligence Scale
 - Weiss Adult Intelligence Scale
 - Weschler Associated Intelligence Scale
 - Weschler Aptitude & Intelligence Scale
70. An effect is said to be significant when,
- $p < 0.1$
 - $p < 0.05$
 - $p > 0.05$
 - $p = 1$
71. What is referred to as a cueing effect on a Posner's cueing task?
- RT on valid trials/RT on invalid trials
 - RT on invalid trials/RT on valid trials
 - RT on invalid trials – RT on valid trials
 - None of the above
72. Impulses from the retina leave the eye via:
- lens
 - cornea
 - optic nerve
 - optic chiasm
73. "Cock party effect" involves the mechanism of:
- Focussed auditory attention
 - Divided auditory attention
 - Change blindness
 - None of the above
74. Who conducted elaborate EEG work that indicated brain activity in the motor cortex occurs before the intention to move?
- Benjamin Libet
 - Victor Lamme
 - Patrick Cavanaugh
 - Daniel Wegner

75. The Load theory of attention was proposed by whom?
- a. Anne Triesman
 - b. Nilli Lavie
 - c. Donald Broadbent
 - d. Stanislas Dehaene