

TEACHER ANSWERS**Section 1 The Practice of Human Biology [22 marks]**

- (1) State a hypothesis for this investigation. (2 marks)

Task D [1] took the longest to discriminate [1]/ task B [1] showed the shortest discrimination time [1]/increasing task complexity [1] increases discrimination time [1]/increased discrimination [1] increases task time [1]

- (2) What was the independent variable? (1 mark)

The different tasks/ the discriminatory tasks/ task complexity [1]

- (3) What was the dependent variable and what was the unit of measurement used? (2 marks)

The decision time taken \ discrimination time [1] (seconds) [1]

Below is a table showing the results taken from a Year 12 student population who completed a series of tasks involving dealing cards accurately into piles. The second part of the table shows discrimination times.

Results Table: Task time and discrimination time results for card playing activity for female and male student as task complexity increases

Brain Investigation	Task time averages				Discrimination tasks		
Student name	Task A	Task B	Task C	Task D	B-A	C-A	D-A
Female [1]	25	36	52	88	11	27	63
Female [2]	29	41	54	83	12	25	54
Female [3]	26	38	45	84	12	19	58
Female [4]	26	34	42	86	8	16	60
Female [5]	22	33	43	70	11	21	48
Female [6]	25	38	48	73	13	23	48
Female [7]	24	34	41	70	10	17	46
Female [8]	21	33	40	74	12	19	53
Female [9]	19	30	38	63	11	19	44
Female [10]	19	30	39	62	11	20	43
Female [11]	25	42	52	62	17	27	37
Female [12]	30	41	49	96	11	19	66
Female [13]	22	32	35	53	10	13	31
Female [14]	21	32	45	83	11	24	62
Female [15]	23	37	45	63	14	22	40
Female [16]	19	35	44	61	16	25	42
Female [17]	28	38	54	91	10	26	63
Female [18]	17	30	42	70	13	25	53
Female averages	23	35	44	74	12	22	51
Male [1]	19	35	40	63	16	21	44
Male [2]	22	33	44	72	11	22	50
Male averages	21	34	42	68	14	22	47

- (4) Construct a line graph that plots the average discrimination time for males and females for tasks B, C, D, E on the graph paper. (6 marks)

Line graphs [1] x & y axis fully labelled [2] title – showing independent and dependent variable [1] even intervals for time [1/2] points plotted accurately [1/2] gender difference indicated with key or different shading or label [1]

- (5) Looking at your graph
(a) Identify which gender showed the shortest discrimination time for task D? (1 mark)

Male [1]

- (b) Identify which gender showed the shortest discrimination time for task B? (1 mark)

female [1]

- (6) Suggest how researchers could increase the (2 marks):

- (a) validity of this experiment **[tests what it's supposed to test]**

establish more control variables/improve experimental design with regards to controlling the card playing technique/ ensure the brand of the deck of cards is the same/the condition of the cards are the same (old, worn or new) [1]

- (b) reliability of this experiment **[extent to which the experiment gives the same result each time]**

repeat experiment/replicate/increase the male sample size as there were only two males/have more trials per task/ use an electronic card shuffler to better randomise the deck of cards each time for each trial [1]

- (7) Identify the main control for this investigation and outline why this was used as the control. (2 marks)

task A [1] because it controls for the discriminatory time of the other tasks/ because it allows you to compare the discriminatory times of the other tasks [1]

- (8) List three other controlled variables. (3 marks)

SAME numbered set of playing cards [1], SAME number of trials (3) [1], SAME order of trials [1], SAME type of stop clock used [1], SAME number of times to shuffle the cards [1], SAME method for exposing the cards prior to placing them on the piles [1]

- (9) Identify the main trend in the data between discrimination time and tasks performed. (2 marks)

the more complicated the task [1] the longer it took to perform the task [1]

Section 2 Processing the data [16 marks]

- (1) Identify which main part of the brain initialises the movement of the sorting out of the cards? (1 mark)

cerebrum [1] OR cerebral cortex [1]

- (2) Identify which main part of the brain completes the movement of the sorting out of the cards? (1 mark)

cerebellum [1]

- (3) Using your knowledge of the nervous system, explain briefly why the discrimination time for task D was longer than the discriminatory time for task B. (2 marks)

more sensory information to process [1] more neurons required [1] more time required for neurons to communicate with each other [1] OR more decision time required [1] more neurons/ neural pathways engaged [1]

- (4) Identify the type of matter involved in saltatory conduction. (1 mark)

white matter [1]

(5) Explain how this type of matter allows saltatory conduction to occur. (4 marks)

It blocks the impulse from moving through it [1] so the impulse has to jump [1] across/over the area of myelin sheath [1] from one gap [where the cell membrane is exposed] to the next/from one node of Ranvier to the next [1]

(6) The motor neurons that innervate the muscles of the arms and fingers receive messages from the connector neurons in the spinal cord. This enables the fingers to clasp and turn over the card to the correct pile. After the neurotransmitter has bound to the receptors on the motor neuron, explain how the electrical impulse is transmitted to the hand to enable this to happen. (7 marks)

the neurotransmitters [1] cause gated sodium channels to open on the motor neuron (post synaptic neuron) [1] sodium ions move inside the neuron's membrane [1] depolarisation occurs resulting in an action potential in the post synaptic membrane [1] the impulse then travels along the postsynaptic axon to its terminal [1] the neuromuscular junction [1] which innervates the muscles of the hand to contract [1]