**Test 4\_16**

**Reading Passage 1**

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| --- |
| **Measuring Intelligence** |

**Some schools have based their entire curriculum around it while others have rejected it completely. There are many educators who agree in part but cannot accept the whole theory in its entirety. Whatever the reaction, Howard Gardner's theory of multiple intelligences has impacted thinking and practice in education.**

Devised in 1983 by Howard Gardner, an American developmental psychologist, the theory of multiple intelligences is already over 30 years old. In his book Frames of Mind, Gardner wrote ‘an intelligence is the ability to solve problems, or to create products, that are valued within one or more cultural settings.’ Gardener’s theory takes issue with the traditional Intelligence Quotient - commonly referred to as IQ - test which infers that intelligence is a single entity which can be defined by a single measure based on short answers to a variety of questions. This test measures only two intelligences, verbal and computational.

There are eight intelligences rather than two, according to Gardner. The first two are verbal-linguistic and mathematical-logical and these are the two that are primarily assessed in traditional tests as well as being the most valued in the mainstream educational system. The next three are musical intelligence, visual-spatial intelligence, or the ability to create and manipulate mental images, and bodily-kinaesthetic intelligence which involves factors such as coordination, balance, speed and strength. The final two intelligences on the original list of seven were interpersonal and intrapersonal intelligences. The former refers to the capacity of understanding the motivations, intentions and desires of other people while the latter refers to the ability to understand oneself. The eighth intelligence which was added later is naturalist intelligence - the ability to discriminate and use features of the environment.

These intelligences are not independent of one another but rather are employed in varying combinations to solve problems or create products or services that are of use. Gardner considers that each person is unique in the combination of intelligences, just as each person’s fingerprint is unique. The original concept of intelligence assumes that it is inherited and therefore not much could be done if one were not good at maths or not talented at music. Gardner argues that everyone has multiple intelligences which can be strengthened through nurturing or weakened through lack of use or practice. He maintains that there is a biological and a cultural basis to intelligence. Biological because each intelligence is anatomically separate, as is evident when there is damage to the brain and one characteristic is affected but others are not; and cultural in that some cultures prize certain abilities over others and so those intelligences will develop to a larger extent than in cultures that do not appreciate them.

Gardner is often criticised for simply describing a set of talents or skills and for having no empirical or research evidence for his list. However, in order to be classified as an intelligence, there were eight criteria that needed to be fulfilled. If any one of the eight was not met, the characteristic being considered was discarded. The theory of multiple intelligences has not been widely accepted by academia as they consider it to be unscientific due to the inadequacy of the criteria he used to define intelligence. Gardner himself admits that some of the judgements he made were more subjective than not. Other arguments against the theory are that some of the intelligences, such as musical and visual-spatial, are talents more than anything else. The difference between an intelligence and a talent is that the former needs to adapt to the demands of everyday life whereas the latter does not.

The theory of multiple intelligences, however, has more fans than critics. This is particularly true in the field of education where many educators had already understood that students have different approaches to learning and just because one does not do so well in one area does not mean they cannot excel in others. Many schools are incorporating Gardner's theory and making changes to their curricula to include the different styles of learning. Students who had previously been isolated by the traditional emphasis on maths and language are achieving success either because a different approach to teaching has been adopted or because there is a new appreciation of different types of intelligence.

The theory of multiple intelligences may not be flawless as Gardner himself admits, but the impact it has had on developmental psychology and education has been a major one. The fostering of the unique blend of intelligences that define each person can only be of advantage to that individual, his family, the society he or she lives in and to the world in general.

**Questions** **1-13**

You should spend about 20 minutes on **Questions 1-13** which are based on Reading Passage 1.

**Questions 1 - 4**

Choose the correct letter **A**, **B**, **C** or **D**.

Write your answers in boxes 1 - 4 on your answer sheet

**1** According to Howard Gardner, an intelligence is……………………

**A** something we are born with and, therefore, unchangeable.

**B** something he discovered 30 years ago.

**C** made up of two abilities - verbal and computational.

**D** a capacity to find solutions and create items of value.

**2** Of the eight intelligences,…………………….

**A** only two are appreciated in traditional schooling.

**B** there are three which are more important than the others.

**C** interpersonal and intrapersonal are much the same thing.

**D** the eighth is considered irrelevant.

**3** Most professionals working in education……………….

**A** consider Gardner's theory to be unscientific.

**B** have already come to their own conclusions about intelligence.

**C** refuse to change the way they teach their students.

**D** prefer a more academic approach to the question of intelligence.

**4** What is the writer’s main purpose in writing the article?

**A** To inform the reader about Gardner's work.

**B** To advise schools to change their intelligence testing approach.

**C** To challenge the idea that people can measure intelligence.

**D** To summarise the changes in educational theory.  
**Questions 5-10**

Complete the summary using the list of words, **A – L**, below.

Write the correct letter, **A - L**, in boxes 5 - 10 on your answer sheet.

According to Howard Gardner, there are eight intelligences that are unique to each person. **5**………………… refers to how easily someone can use language – for example using language to solve a problem. An awareness of the physical self and the use of movement implies **6**………………… intelligence, while **7** ……………… intelligence involves the ability to change and form a variety of mental pictures. The ability to discern pitch, tone and rhythm implies **8** ………………… intelligence and **9** ……………… intelligence would be obvious in a more introverted, less socially inclined, person while **10** ………………… is evident in an extrovert who has the ability to empathise with others.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **A** | visual-spatial | **B** | naturalist | **C** | mathematical-logical |
| **D** | intrapersonal | **E** | musical | **F** | bodily-kinaesthetic |
| **G** | environmental | **H** | interpersonal | **I** | verbal-linguistic |
| **J** | quotient | **K** | educational | **L** | personal |

**Questions 11-13**

Do the following statements agree with the information given in Reading Passage 1?

In boxes 11 - 13 on your answer sheet, write

|  |  |  |
| --- | --- | --- |
|  | **YES** | if the statement reflects the claims of the writer |
|  | **NO** | if the statement contradicts the claims of the writer |
|  | **NOT GIVEN** | if it is impossible to say what the writer thinks about this |

**11** Gardner agrees that his methods could have been more scientific.

**12**       Some students are benefiting because Gardener's theory is being used in their school.  
**13**       Gardner's theory of multiple intelligences has improved society through education.

**Reading Passage 2**

Haptic technology is a tactile feedback technology which allows computer users to interact with a virtual world by touch. This is achieved through a haptic interface such as a pen, stick, racket or even scalpel which allows the user to 'feel' the virtual world; an illusion of course. An illusion, however, that has created endless possibilities. This has become much more than an enhancement of the computer game or amusement arcade thrills of old. The goal of computer haptics is to simulate much more sophisticated and sensitive sensations such as the difference between the feel of a healthy heart and a sick one, the manipulation of a single cell under a microscope and even the texture of a wool coat for sale on the internet.

Haptics is the science and physiology of touch and is something that has been studied for many years. Scientists know a great deal about the biology of human touch but the transference of this knowledge into virtual reality systems was a much harder task than supplying visual and auditory information through a computer. Computer scientists wanted more than the trembling of a joystick or vibrations through a keyboard. They wanted the user to be able to reach inside the computer screen and touch what was inside the virtual world - the cold, hard steel of a weapon or the weight and texture of a moon rock. Scientists also wanted to take robotics a step further - robotic hands doing heavy and dangerous work had become a common occurrence but the hands of a machine responding to touch to carry out delicate tasks like microsurgery would be advanced technology indeed.

The first successful construction of a device capable of delivering haptic stimulation was achieved in 1993; after many years of research, it was finally possible to touch and feel a computer-generated object. Computer haptics - defined as the hardware and software systems required to convey the touch and feel of virtual objects - was born.

Although there are different types of haptic systems, they all have two things in common: software which determines the forces generated when a virtual identity, or user, comes into contact with an object and a device which enables the transmission of the force to the user. Software calculates force through a process called haptic rendering where, for example, 3-D models of the objects in a virtual world are designed to calculate touch data by evaluating the impact of ‘force lines’ they come into contact with. An actuator, which provides the mechanical motion in response to the electrical stimulus, then applies the forces to the skin for touch feedback. As a result, a 3-D force feedback controller allows the computer gamer to feel in his or her body the difference in the ‘experience’ of leaping over a waterfall or jumping over a puddle.

Haptic technology is developing to such an extent that it is now possible for trainee surgeons to cut through a liver and feel the scalpel as it slices through the ligaments; they can feel if they have cut too far or too hard and have to start again. Some surgeons report feeling guilt for ruining a perfectly good internal organ - even though, of course, there was no such physical thing. Aircraft mechanics and soldiers are also using haptic technology as part of their training. It has been widely recognised that the sensation of touch is a much more effective learning mechanism than sight or hearing, which is why haptic technology is so valuable as a teaching tool. A combination of the three senses means there is more information sent to the brain for processing so a long-term goal is the precise integration of touch, sight and hearing.

As touch enhances understanding, the role haptic technology could play in education is obvious. Haptics as a tool for augmenting instruction, particularly in the field of science, would enable students to play an interactive role in learning. Of the five senses, it is only through touch that the world can be manipulated and whether that manipulation is carried out by a fifth grader exploring a moon surface or a dental student performing a virtual root canal, the learning process is maximised.

A major difficulty inhibiting the advancement of haptics is the exact degree of timing involved if the stimulations are to be of any value. A surgeon employing haptic technology to operate on a patient from a remote location cannot do his or her work if there is a time delay of even seconds. Where the surgeon's hands go is where the robotic scalpel must go, otherwise mistakes will be made.

The prohibitive cost of production means that, for now, the most sophisticated touch technology is in the control of the industrial, military and medical giants. Very few products are available to mainstream consumers but, because current research indicates that the technology augers well for significant revenue opportunities in the future, researchers and designers continue to actively pursue commercial applications.

**Questions** **14-26**

You should spend about 20 minutes on **Questions 14-26**, which are based on Reading Passage 2.  
**Questions 14 - 18**

Choose the correct letter **A**, **B**, **C** or **D**.

Write your answers in boxes 1 – 5 on your answer sheet.

**14** The aim of computer haptics is…………………

**A** to enhance the computer game experience.

**B** to manipulate consumers into buying products on-line.

**C** to create endless illusions and possibilities.

**D** to recreate realistic sensations in a virtual world.

**15** According to the passage, the sense of touch is ………………

**A** a science and physiology.

**B** of interest to biologists.

**C** difficult to transmit through computers.

**D** necessary when performing microsurgery.

**16** The writer gives the example of robotic hands responding to touch…………

**A** to explain how surgeons will operate in the future.

**B** to justify the need for haptic technology.

**C** to illustrate what haptics was able to achieve.

**D** to show how haptics is an advanced technology.

**17** A 3-D force feedback controller enables the user to …………..

**A** experience true-to-life sensations.

**B** respond to an electronic stimulus.

**C** calculate the force created by haptic rendering.

**D** come into contact with force lines.

**18** What would be a suitable title for the passage?

**A** The advantages of computer haptics

**B** The exciting world of virtual computers

**C** The past, present and future of haptics

**D** An insight into computer technology

**Questions 19-22**

Complete the summary below.

Choose **NO MORE THAN TWO WORDS** from the passage for each answer.

Write your answers in boxes 19 – 22 on your answer sheet.

Regarding learning, it is well-known that **19** ………………… is the superior sense. Haptics improves the quality of learning by making the experience more **20** …………………, using manipulation to reinforce inform ation processing. For the time being, high production costs are keeping this technology from being available to **21** ………………… such as schools and individual students. Like many new technologies, however, the **22** ………………… to be made from popular trade will eventually bring prices within reach of the general public.

**Questions 23-26**

Complete the sentences with words taken from Reading Passage 2.

Choose no more than **TWO WORDS** from the passage for each answer.

**23** Hardware and software enabling the transmission of touch and feel together comprise …………………….. .

**24** The actuator supplies ……………………..when it transmits force to the user's skin.

**25** ……………………..surgery can only be successful if the issue of timing is resolved.

**26** Profit is one motive for the development of more …………………….. of haptics in the future.

**Reading Passage 3**

**Defining Beauty**

**A** That beauty is in the eye of the beholder is a well-known truism often told. What is less well-known is that there is more to the perception of beauty than different preferences or tastes. According to some researchers, a lot of what is considered beautiful depends, to a large extent, on how visually complex an image is perceived to be.

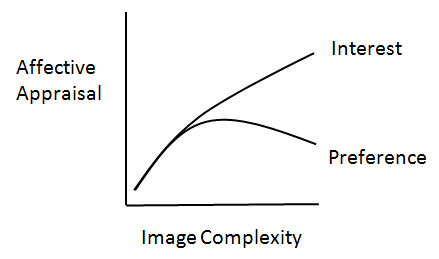
**B** A mathematical formula is being sought for measuring the complexity of an image based on elements such as the lines and angles inherent in it. Not only is the number of lines and angles important, but also how regular and diverse they are. It is thought that this would give a measure of how beautiful an image will be perceived to be. Why should such a thing be desired? Surely the way a stimulus is perceived is of more importance than the number or diversity of its elements? The usefulness of the application for businesses, artists and advertisers is quite obvious for there is money to be made in all of these fields if people like and respond positively to what they see.

**C** To this end, compression techniques based on an algorithm devised by Hughes and Kent (1978) have been developed which measure visual complexity by reducing the organization of a picture to a string of numbers. Strings containing mostly repeated numbers mean the image contains few elements or is more homogeneous in design. Longer strings with more alternatives and fewer repetitions mean the picture is more complex. Used alone, however, they are not an adequate measure of how beauty is perceived.

**D** Fredrickson (1971) was the first to come up with a formula for measuring beauty. He suggested that preference and interest increase linearly with visual complexity but only until a certain point. After that, any increase in complexity results in less arousal and a downturn in preference - as shown in Figure 1. Though this theory attracted a great deal of attention, the point at which too much complexity results in less pleasure was not clearly devised. There is no way of measuring with any certainty at what level the visual complexity of an image will repel rather than appeal. Watson & Watson offered an alternative to the argument in 1989 when they substituted the word ‘arousal’ with ‘information processing’. In their approach, they argue that people prefer interesting environments they can make sense of, so one which offers both coherency and information would be preferable to one that is incoherent and boring. This theory supports the idea that human beings seek moderately complicated coherent environments such as those found in nature and the perception of what is beautiful is more objective than subjective.

**E** The patterns inherent in nature are repetitive as can be seen in the symmetry and lines of mountain ranges, rivers, plants and trees. These visual patterns, when repeated on finer and finer scales in an image, are called fractals. When these patterns are found in a work of art, they are thought to engage the cognition modules or thought processes linked with the regulation of the emotions (Wilson, 1984). More research by Thornton et al (2007) suggested that the mind responds to fractal patterns and, as a result, images containing them receive more attention and engage the parts of the cerebrum that process visual spatial stimuli.

**F** The amount of fractal dimension (D) present in an image or work of art seems to make a difference in the interest it attracts and one reason for this is because it stimulates a biophilic, or a preference for natural forms, response. Of course, the higher the fractal dimension, the more visually complex an image is. This supports Fredrickson’s theory that preference and interest in an image increases with the visual complexity but still does not explain at which point an image becomes too complicated and a viewer’s interest is lost. According to Lawford et al (2000), there are low, medium and high categories of D with respect to aesthetic preference. They concluded that people consistently prefer fractal images in the medium range. This suggests that the point at which too much complexity results in a decreased perception of beauty depends on the fractal dimension present (see Fig. 1).



**Figure 1**: The effect of complexity on preference and interest (Fredrickson, 1971).

**G** A precise mathematical formula for how beauty is perceived is elusive, however. People are unreliable judges of visual complexity as their evaluation is based on how familiar an object is. For example, a round apple may be as visually complicated as a square apple but the former is seen as less so due to its normality. Complexity alone, though important, is an incomplete measure of beauty as the more abstract the image, the less it is perceived as beautiful because it cannot be understood. Natural images containing fractal content are generally perceived to be more beautiful.

**H** Elements such as colour which play a major part in the way an artist communicates also need to be taken into account and these are elements which, so far, have defied a mathematical formula. In a paper published in the latest edition of the British Journal of Psychology, Thompson found that a fractal dimension combined with a rating for visual complexity was somewhat effective in predicting the perception of beauty, but an objective measure of beauty in an image has still not been achieved.

**Questions 27-29**

You should spend about 20 minutes on **Questions 27-40**

Choose the correct letter, **A, B, C** or **D.**

Write the correct letter in boxes 27-29 on your answer sheet.

**27** Advertisers are interested in predicting how appealing an image is because……………..

**A** the usefulness of the application is obvious.

**B** the more appealing the advertisement, the more successful it will be.

**C** of the algorithm which reduces beauty to a string of numbers.

**D** their business depends on artists.

**28** ‘Information processing’ was substituted for ‘arousal’ because………………

**A** it clarifies at what point people might lose interest in an image.

**B** ‘arousal’ was incoherent and boring.

**C** an image can be understood but not be appealing.

**D** Watson and Watson consider beauty to be subjective.

**29** What is the writer’s main purpose in writing the article?

**A** to explain why fractals exist in nature

**B** to describe how people judge beauty

**C** toinform the reader about patterns found in nature

**D** to discuss the advantages of Fredrickson’s theory

**Questions 30-35**

Look at the following list of statements (Questions 30-35) and the list of researchers below.

Match each theory with the correct expert(s), **A-E**.

Write the correct letter, **A-E**, in boxes 30-35 on your answer sheet.   
**NB** You may use any letter more than once.  
**30**       to date, there is no absolute formula to measure beauty

**31**       there is a limit to how interesting an image is

**32**       natural forms are preferred over man made

**33**       fractals in an image are important as they arouse emotions

**34**       people are more interested in an image which they can understand

**35**       devised the first formula that went some way towards measuring how beauty is perceived

|  |  |
| --- | --- |
| **List of Researchers** | |
| **A** | Fredrickson |
| **B** | Watson & Watson |
| **C** | Wilson |
| **D** | Thompson |
| **E** | None of the above |

**Questions 36-40**

Reading passage 3 has eight paragraphs, **A-H**.

Which paragraph contains the following information?

Write the correct letter **A-H** in boxes 36-40 on your answer sheet.

**36**       an original formula that did not quite succeed

**37**       the role the brain plays in the judgement of art

**38**       a replacement to make a flawed theory better

**39**       one reason why it is so difficult to find a formula for beauty

**40**       why a precise formula for how people judge beauty is important