

**YEAR: 10**

**2017**

**SUBJECT: Science**

**Semester One Exam**

**TIME: 120 minutes**

**QUESTIONS: 30 Multiple Choice (30 marks)**

**5 Short Answer (60 marks)**

**TOTAL MARKS: 90 marks**

**DO NOT WRITE ON OR MARK THIS PAPER**

SECTION ONE - MULTIPLE CHOICE [20 marks]

This section has **30** questions. Answer **all** questions on the separate Answer Sheet provided. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. Chromosomes are found in the nucleus of:

1. most cells of the body
2. brain cells only
3. gametes only
4. stem cells that have not yet differentiated

2. What is the name given to an individual whose alleles are the **same** for a characteristic?

1. heterozygous
2. homozygous
3. monohybrid
4. homologous

3. The periodic table:

1. is a systematic chart listing all known elements
2. arranges elements from lowest to highest atomic number
3. arranges elements in columns called groups
4. all of the above

4. Which of the following BEST describes a neutral atom?

In neutral atoms, there are always **equal** numbers of:

1. protons and neutrons
2. protons and electrons
3. protons, neutrons and electrons
4. neutrons and electrons

5. What is the term used for a row in the periodic table?

1. group
2. row
3. line
4. period

6. An atom has a mass number of 27. It therefore has:

1. 13 protons, 14 neutrons and 14 electrons
2. 13 protons, 14 neutrons and 13 electrons
3. 14 protons, 14 neutrons and 14 electrons
4. 13 protons, 13 neutrons and 13 electrons

7. Which of the following shows the correct conjugate base pairs?

1. thymine and guanine
2. adenine and guanine
3. cytosine and adenine
4. cytosine and guanine

8. If a disease in humans is said to be sex linked, what pair of chromosomes must contain the gene responsible for the disease?

1. 21st pair
2. 22nd pair
3. 23rd pair
4. 24th pair

9. Which of the following is a noble (inert) gas?

1. Oxygen
2. Chlorine
3. Neon
4. Hydrogen

10. If a diploid cell in a plant has 32 chromosomes, how many chromosomes will be in each gamete?

1. 32
2. 30
3. 16
4. 14

11. Which group number do the alkaline earth metals belong to?

1. Group 1
2. Group 2
3. Group 3
4. Group 7

12. Which of the following is the **most** reactive metal element?

1. potassium
2. iron
3. aluminium
4. steel

13. Which of the following best describes what occurs during **anaphase**?

1. Chromosomes line up in a single line across the centre of the cell
2. Chromosomes become visible and the nuclear membrane disappears
3. Chromatids are pulled apart by spindle fibers, toward the poles of the cell
4. Cytoplasm divides down the middle of the cell

14. What is the term used to describe alleles that have equal dominance?

1. independent assortment
2. recession
3. co-dominance
4. incomplete dominance

15. Which of the following statements about the number of daughter cells produced is CORRECT?

1. mitosis = 4 daughter cells, meiosis = 2 daughter cells
2. mitosis = 1 daughter cell, meiosis = 2 daughter cells
3. mitosis = 1 daughter cell, meiosis = 4 daughter cells
4. mitosis = 2 daughter cells, meiosis = 4 daughter cells

16. The structure of DNA may be described as a twisted ladder. Recall what forms the upright parts of the ladder.

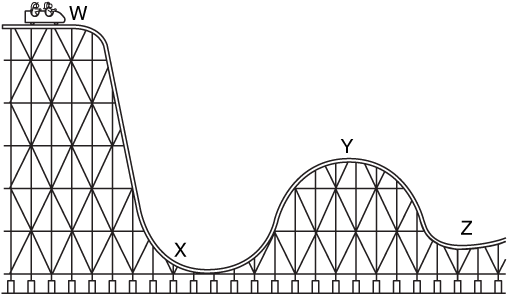
1. alternating sugar and phosphate units
2. nitrogen bases
3. amino acids
4. proteins

17. Nitrogen is in period 2, group 15. Which of the following elements would have the most **similar** properties to nitrogen?

1. Phosphorus P (period 3, group 15)
2. Oxygen O (period 2, group 16)
3. Neon Ne (period 2, group 18)
4. Sodium Na, because its symbol also starts with N

18. Which of the following best describes the energy changes occurring when an apple falls from a tree branch to the ground below?

1. gravitational potential→kinetic→sound
2. gravitational potential→elastic potential→sound
3. kinetic→sound→gravitational potential
4. elastic potential→sound→kinetic

Questions **19 and 20** refer to the diagram of a rollercoaster below.

19. At which point on the rollercoaster does the cart have the **most** gravitational potential energy?

1. W
2. X
3. Y
4. Z

20. At which point on the rollercoaster does the cart have the **most** kinetic energy?

1. W
2. X
3. Y
4. Z

21. One chromosome consists of two:

1. Centromeres
2. Chromatids
3. Chromopores
4. Genes

22. During which phase does the DNA condense into chromosomes?

1. Interphase
2. Cytokinesis
3. Metaphase
4. Prophase

23. How many daughter cells are produced in meiosis?

1. 1
2. 2
3. 4
4. 6

24. Which of the following is TRUE regarding kinetic energy?

1. The greater an object’s mass, the greater its kinetic energy
2. The greater an object’s speed, the greater its kinetic energy
3. An object at rest has no kinetic energy
4. All of the above

25. Which of the following is NOT a characteristic of metals?

1. Lustrous
2. Conduct heat and electricity
3. Brittle
4. Ductile

26. The elements that sit between group 3 and 12 of the periodic table are known as the:

1. Transition metals
2. Alkali metals
3. Non-metals
4. Rare earth elements

27. An element is a:

1. Substance that contains molecules
2. Pure substance made up of only one type of atom
3. Pure substance made up of two types of atoms
4. Substance that contains no bonded atoms

28. What is the name of the outermost shell in an atom?

1. Outer shell
2. Diatomic shell
3. Valence shell
4. Electronic shell

29. Red-green colour-blindness is an X-linked recessive disorder. A mother with this condition and normal visioned father will pass this allele to:

1. her daughters only.
2. all of her children.
3. her sons only.
4. none of her children.

30. An allele is best defined as

1. a lethal recessive phenotype
2. a lethal dominant phenotype
3. a type of gene found only on the sex chromosome
4. an alternative form of gene at a given position on the chromosome.

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**Year 10 Science**

**Semester 1 Exam 2017**

**ANSWER BOOKLET**

**NAME:**

**FORM: DATE:**

**Multiple Choice Short Answer Total**

**/ 90**

**/ 60**

**/35**

**/ 30**

**/20**

**SECTION ONE: Multiple choice answers. Cross (X) through the correct answer.**

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **1** | **Xxx** | **b** | **c** | **d** |  | **16** | **Xxx** | **b** | **c** | **d** |
| **2** | **a** | **xxx** | **c** | **d** |  | **17** | **Xxx** | **b** | **c** | **d** |
| **3** | **a** | **b** | **c** | **xxx** |  | **18** | **Xxx** | **b** | **c** | **d** |
| **4** | **a** | **xxx** | **c** | **d** |  | **19** | **xxx** | **b** | **c** | **d** |
| **5** | **a** | **b** | **c** | **xxx** |  | **20** | **a** | **xxx** | **c** | **d** |
| **6** | **a** | **xxx** | **c** | **d** |  | **21** | **a** | **xxx** | **c** | **d** |
| **7** | **a** | **b** | **c** | **xxx** |  | **22** | **a** | **b** | **c** | **xxx** |
| **8** | **a** | **b** | **xxx** | **d** |  | **23** | **a** | **b** | **xxx** | **d** |
| **9** | **a** | **b** | **Xxx** | **d** |  | **24** | **a** | **b** | **c** | **xxx** |
| **10** | **a** | **b** | **xxx** | **d** |  | **25** | **a** | **b** | **xxx** | **d** |
| **11** | **a** | **xxx** | **c** | **d** |  | **26** | **xxx** | **b** | **c** | **d** |
| **12** | **xxx** | **b** | **c** | **d** |  | **27** | **a** | **xxx** | **c** | **d** |
| **13** | **a** | **b** | **xxx** | **d** |  | **28** | **a** | **b** | **xxx** | **d** |
| **14** | **a** | **b** | **xxx** | **d** |  | **29** | **a** | **xxx** | **c** | **d** |
| **15** | **a** | **B** | **c** | **xxx** |  | **30** | **a** | **b** | **c** | **xxx** |

SECTION TWO - SHORT ANSWER SECTION [60 marks]

This section has **5** questions. Answer **all** questions in the spaces provided. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Question 1.**

1. Complete the following table: (12 marks)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| ELEMENT | ATOMIC NUMBER | ELECTRON SHELL DIAGRAM | ELECTRON CONFIGURATION | ELEMENT SYMBOL |
| Oxygen | **8** | **Image result for oxygen electron shell diagram** | **2, 6** | **O** |
| Aluminium | **13** | **File:Electron shell 013 Aluminum.svg** | **2, 8, 3** | **Al** |
| Potassium | **19** | **Image result for potassium electron shell diagram** | **2, 8, 8, 1** | **K** |

1. Identify **two differences** between the alkali metals and the noble gases: (4 marks)

|  |  |
| --- | --- |
| Alkali metals | Noble gases |
| **One electron in valence shell**  **Will react with other elements**  **Generally solid state**  **Metal**  **Lustrous, shiny, malleable**  **Any other reasonable comparisons** | **Full valence shell**  **Non-reactive**  **Gaseous state**  **Non-metal**  **Not lustrous, shiny nor malleable** |

**Question 2.**

1. The diagram below shows a simplified illustration of the stages of mitosis. However, the stages are not in the correct order. Identify the correct order and write the letters corresponding to each stage, in order on the line below.

 (5 marks)

\_\_\_\_\_ **D B A E C** \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. Complete the table by identifying **three** **differences** between mitosis and meiosis.

(6 marks)

|  |  |
| --- | --- |
| MITOSIS | MEIOSIS |
| Occurs in most cells of the body | Occurs only in the gametes |
| **2 daughter cells**  **Identical daughter cells**  **One cell cycle**  **No crossing over**  **Diploid daughter cells (46 chromosomes)**  **Growth and repair**  **Any other reasonable comparisons** | **3 daughter cells**  **Non identical daughter cells**  **Two cell cycles**  **Crossing over**  **Haploid daughter cells (23 chromosomes)**  **Sexual reproduction** |

**Question 3.**

Consider the following pedigree for hair colour in mice. Mice can have either black coats (B) or brown coats (b). Black coats are dominant to brown.



Male Female

1. What is the genotype for brown coats? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**bb**\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (1 mark)
2. Which individuals have brown coats? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**4, 10**\_\_\_\_\_\_\_\_\_\_\_\_ (2 marks)
3. How are individuals 10 and 11 related to each other? \_**siblings/ brother-sister**\_ (1 mark)
4. Individuals 6 and 7 are 'carriers' of the brown allele. What is meant by the term carrier?

(2 marks)

\_\_\_\_\_ **Possess the recessive allele**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_**Do not have the condition (brown hair)\_/ Do not present the brown hair phenotype**

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. What is the genotype of a carrier in this scenario? \_\_\_\_\_**Bb**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (1 mark)

**Question 4.**

Having dimples (D) in your cheeks is dominant to having no dimples (d).

1. Write the possible genotypes and phenotypes for this trait. (6 marks)

Genotypes Phenotypes

\_\_\_**DD**\_\_\_\_\_\_ \_\_\_**Dimples**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_**Dd**\_\_\_\_\_\_ \_\_\_**Dimples**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_**dd**\_\_\_\_\_\_ \_\_\_**No dimples**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

A heterozygous man, who has dimples, has children with a woman with no dimples.

1. Draw a Punnett square to show the potential offspring these two individuals can produce.

(3 marks)

|  |  |  |
| --- | --- | --- |
|  | **d** | **d** |
| **D** | Dd | Dd |
| **d** | dd | dd |

1. What is the probability (%) that they produce a child with **no dimples**? \_**50%**\_\_ (1 mark)

Two heterozygous people, who both have dimples, have a child together.

1. Draw a Punnett square to show the potential offspring these two individuals can produce.

|  |  |  |
| --- | --- | --- |
|  | **D** | **d** |
| **D** | DD | Dd |
| **d** | Dd | dd |

(3 marks)

1. What is the probability (%) that they produce a child with dimples? \_\_\_**25%**\_\_\_ (1 mark)

**Question 5.**

**Work= f** x **d Gravitational Potential Energy = m** x **g** x **h** where g=9.8 m/s

**Kinetic Energy** = **0.5** x **m** x **v2**

1. An elastic band is stretched back and then released. It travels a distance of 5 metres. If the force required to pull the elastic band was 5 Newtons, calculate the amount of work done. Show your working.

(2 marks)

**W= fd = 5 x 5**

**W= 25J**  \*must provide J units to get mark for correct answer

1. State the law of conservation of energy: (1 mark)

**Energy cannot be created or destroyed**

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. Tony the firefighter has a mass of 90kg. He climbs up a 7 meter ladder to rescue a cat. Calculate his gravitational potential energy. Show your working and include the appropriate units. (2 marks)

**GPE= mgh = 90 x 9.8 x 7**

**GPE= 6,174J**  \*must include unit J to get marks for correct answer

1. Tony has a rough summer and gains 10 kg. He attends another cat rescue; this time he has to climb a 20 meter ladder. Calculate his gravitational potential energy. Show your working and include the appropriate units. (2 marks)

**GPE= mgh = 100 x 9.8 x 20**

**GPE= 19,600J**  \*must include unit J to get marks for correct answer

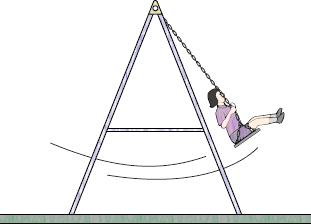
1. Tony climbs down the ladder, but the cat takes off. If the cat has a mass of 6kg, and runs at a speed of 5 m/s, what is its kinetic energy? Show your working. (2 marks)

**KE = 0.5mv2 = 0.5 x 100 x 52**

**KE = 1250J** \*must include unit J to get marks for correct answer

1. When a person is pushed on a swing, they move back and forth. Potential energy is continually being converted into kinetic energy, and then back into potential energy. If they STOP being pushed and sit still on the swing, eventually the swing comes to a stop.

Suggest **one** reason as to why this occurs.



Loss of energy due to (any of the following):

**heat, sound, friction** (1 mark)

1. The greater the rebound height of a ball, the greater the efficiency of energy transfer from gravitational potential energy to kinetic energy. Five balls are all dropped from a height of 4m.

The rebound height of each is listed in the table below:

|  |  |
| --- | --- |
| **Type of ball** | **Rebound height (m)** |
| Basketball | 1.42 |
| Tennis ball | 1.5 |
| Squash ball | 0.05 |
| Cricket ball | 0.68 |

Which ball was the most energy efficient? \_\_\_\_**Tennis ball**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (1 mark)

Not all of the kinetic energy was converted back into gravitational potential energy on the rebound. Where did it go?

(1 mark)

**\_\_\_\_\_Heat energy, sound energy,\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

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