**YEAR 10 SCIENCE EXTENSION**

**EXAM**

**2017**



Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Teacher: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Science Class: 10.

# TIME ALLOWED FOR THIS PAPER

## Reading time before commencing work: ten minutes

Working time for the paper: 1 hour 30 minutes

# MATERIALS REQUIRED/RECOMMENDED FOR THIS PAPER

**To be provided by the supervisor:**

Multiple-choice Question Booklet

Question/Answer Booklet

Data Sheet

**To be provided by the candidate:**

Standard items: pens (blue/black preferred), pencils (including coloured), sharpener,

eraser, ruler, highlighters

Special items: non-programmable calculator

# IMPORTANT NOTE TO STUDENTS

No other items may be taken into the examination room. It is **your** responsibility to ensure that you do not have any unauthorised notes or other items of a non-personal nature in the examination room. If you have any unauthorised material with you, hand it to the supervisor **before** reading any further.

**Structure of this paper**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Section | Number of questions available | Number of questions to be answered | Suggested working time  (minutes) | Marks available |
| Section One:  Multiple-choice | 30 | 30 | 30 | /30 |
| Section Two:  Short answer | 11 | 11 | 40 | /60 |
| Section Three:  Extended answer | 3 | 2 | 20 | /20 |
|  | | | | /110 |

**Instructions to candidates**

1. Answer the questions according to the following instructions.

Section One: Answer all questions on the front of the separate Answer Booklet provided. **For each questions put a cross (X) in the box to indicate your answer. Use only a blue or black pen to mark the boxes.** If you make a mistake, shade that square then put a cross on your new answer. Do not erase or use correction fluid/tape. Marks will not be deducted for incorrect answers. No marks will be given if more than one answer is completed for any question.

Sections Two and Three: Write your answers in the Question/Answer Booklet.

2. **When calculating numerical answers, show your working or reasoning clearly**. Express numerical answers to the appropriate number of significant figures and include appropriate units where applicable.

3. You must be careful to confine your responses to the specific questions asked and to follow any instructions that are specific to a particular question.

4. Remember to use pencil and ruler for all diagrams. Include clear labels and titles where appropriate.

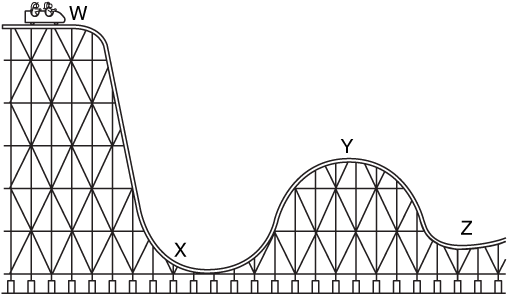
**Multiple Choice Section. Answer in the booklet provided. 30 marks.**

1. An element is a:
2. substance that contains molecules.
3. pure substance made up of only one type of atom.
4. pure substance made up of two types of atoms.
5. substance that contains no bonded atoms.
6. An atom has a mass number of 27. It therefore has:
7. 13 protons, 14 neutrons and 14 electrons.
8. 13 protons, 14 neutrons and 13 electrons.
9. 14 protons, 14 neutrons and 14 electrons.
10. 13 protons, 13 neutrons and 13 electrons.
11. 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.

1. What is the name of the outermost shell in an atom?
   1. Outer shell.
   2. Diatomic shell.
   3. Valence shell.
   4. Electronic shell.
2. Nitrogen is in period 2, group 15. Which of the following elements would have the most similar properties to nitrogen?
3. Phosphorus P (period 3, group 15).
4. Oxygen O (period 2, group 16).
5. Neon Ne (period 2, group 18).
6. Sodium Na, because its symbol also starts with N.
7. Which of the following shows the correct conjugate base pairs?
8. Thymine and guanine.
9. Adenine and guanine.
10. Cytosine and adenine.
11. Cytosine and guanine.
12. Which of the following statements about the number of daughter cells produced is CORRECT?
13. Mitosis = 4 daughter cells, meiosis = 2 daughter cells.
14. Mitosis = 1 daughter cell, meiosis = 2 daughter cells.
15. Mitosis = 1 daughter cell, meiosis = 4 daughter cells.
16. Mitosis = 2 daughter cells, meiosis = 4 daughter cells.
17. What is the name given to an individual whose alleles are the **same** for a characteristic?
18. Heterozygous.
19. Homozygous.
20. Monohybrid.
21. Homologous.
22. What is the term used to describe alleles that have equal dominance?
23. Independent assortment.
24. Recession.
25. Co-dominance.
26. Incomplete dominance.
27. Red-green colour-blindness is an X-linked recessive disorder. A mother with this condition and normal visioned father will pass this allele to:
28. her daughters only.
29. all of her children.
30. her sons only.
31. none of her children.
    * 1. Which of the following best describes the energy changes occurring when an apple falls from a tree branch to the ground below?
32. Gravitational potential→kinetic→sound.
33. Gravitational potential→elastic potential→sound.
34. Kinetic→sound→gravitational potential.
35. Elastic potential→sound→kinetic.

Questions **12 and 13** refer to the diagram of a rollercoaster below.

1. At which point on the rollercoaster does the cart have the **most** gravitational potential energy?
2. W
3. X
4. Y
5. Z
6. At which point on the rollercoaster does the cart have the **most** kinetic energy?
7. W
8. X
9. Y
10. Z
11. Which of the following is TRUE regarding kinetic energy?
12. The greater an object’s mass, the greater its kinetic energy.
13. The greater an object’s speed, the greater its kinetic energy.
14. An object at rest has no kinetic energy.
15. All of the above.
16. The kinetic energy of a ball rolling down along a table can be calculated using the formula Ek=½mv2. . If the mass of the ball is 1kg and the velocity is 2ms-1: what kinetic energy does the ball have?
17. 2 J.
18. 1 J.
19. 0.5 J.
20. 3. J.
21. What is the difference between displacement and distance?
22. Distance is the metres travelled plus the direction.
23. There is no difference.
24. Displacement must include the direction travelled.
25. Displacement is only the metres travelled.
26. Speed is measured using
27. seconds.
28. kmh-1 only.
29. ms-1.
30. Newtons .
31. A car travels a distance of 100m in 10 seconds. To calculate its average speed you will need to
32. divide 100 by 10.
33. divide 10 by 100.
34. multiply 100 by 10.
35. subtract 10 from 100.

**Use the example given to answer question 19 and 20.**

A tiger runs 500m east, then turns and runs 200m west. If the total journey took 100s:

1. the distance travelled was
2. 700m.
3. 500m.
4. 200m.
5. 100.
6. the displacement was:
7. 300m.
8. 300m east.
9. 2 ms-1.
10. 500m.
11. To convert 12 minutes to seconds you would:
12. divide by 60.
13. divide by 36.
14. multiply/times by 3.6.
15. multiply/times by 60.
16. A racehorse runs a race that starts and finishes at the same point. If the race was 1000 metres, what was the displacement of the horse when it finished?
17. 1000 metres.
18. 500 metres.
19. 10 metres.
20. 0 metres.
21. If acceleration is shown to slow down we have to represent it as a
22. positive number.
23. a number that is greater than 1.
24. negative number.
25. a number that is greater than 10.
26. The acceleration due to gravity :
27. is the same on all planets.
28. changes your mass on different planets.
29. changes your weight on different planets.
30. is a number that can’t be measured.
31. A trolley with an initial velocity of 5 ms-1 attained a velocity of 25 ms-1 in 4 seconds. The acceleration of the trolley was:
32. 25 ms-2.
33. 10 ms-2.
34. 5 ms-2.
35. 4 ms-2.
36. A car was uniformly accelerated from rest at 7 ms-2. How long did it take to reach a velocity of 56 ms-1?
37. 7.0 s .
38. 8.0 s .
39. 14.0 s.
40. 56.0 s .
41. Inertia can be defined as:
42. the amount of matter in an object.
43. a tendency of an object to resist a change in its motion.
44. the force of gravity on an object.
45. when a force makes something move.
46. A 90 N force is applied to a 65 kg mass. The mass will accelerate at approximately:
47. 7.2 ms-2.
48. ms-2.
49. 1.4 ms-2.
50. 5.9 ms-2.
51. A skydiver glides to the ground at a steady speed of 7 metres per second. Which statement below best describes what is happening?
52. The upward force of air resistance acting on the skydiver is smaller than the downward weight force that is acting.
53. The upward force of air resistance acting on the skydiver is larger than the size of the downward weight force.
54. The upward force of air resistance balances the downward force of gravity acting on the skydiver.
55. The weight force that acts on the skydiver is larger than the upwards force of air resistance.
56. The Law of Conservation of Energy:
57. states that energy when riding to the top of a hill doesn’t change.
58. states that energy can be changed from one form to another.
59. there is no such law for energy.
60. states that energy cannot be destroyed but that it doesn’t change either.

**End of Section One**

****

**SEMESTER 2 2017**

**YEAR 10 SCIENCE EXTENSION EXAM:**

**ANSWER BOOKLET**

**NAME:**

**FORM: DATE:**

**Multiple Choice Short Answer Extended Answer Total**

**/64**

**/30**

**/20**

**/114**

**SECTION ONE: Multiple choice answers**

**Cross (X) through the correct answer.**

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

**SECTION TWO: SHORT ANSWER (60 marks)**

**Question 16**

Classify the following as situations in which forces are balanced or unbalanced.

a. A motor bike accelerating away from traffic lights. (1 mark)

***UNBALANCED***

b. A car travelling at a constant 100 kmh-1 straight down a freeway. (1 mark)

***BALANCED***

**Question 17**

A short form of Newton’s First Law is ***inertia***. Explain what inertia is and how it relates to the mass of an object. (2 marks)

***Inertia is a property of an object which makes it keep doing what it is already doing – that is, when moving it wants to stay moving and when still it wants to stay still (1 mark)***

***Mass is a measure of inertia – more mass will lead to more inertia, less mass will lead to less inertia (1 mark)***

**Question 18**

Mr Miles was doing time-trials on his bike around a 400 metre horizontal track.

(i) He took 32 seconds to travel 400 m. What was his average speed? (4 marks)

|  |  |
| --- | --- |
|  | 1 mark |
|  | 1 mark |
|  | 1 mark |
| units: ms-1 or m/s | 1 mark |

(ii) Compare the forward force on the bike with the backward force on the bike when Mr Miles was travelling at a constant velocity. (1 mark)

***They are equal***

**Question 19**

You are sliding down a hill after falling off your bike. The road is applying of force of -90 N (due to friction). If you have a mass of 50 kg, what was your acceleration?

(4 marks)

|  |  |
| --- | --- |
|  | 1 mark |
|  | 1 mark |
|  | 1 mark |
| units: ms-2 or m/s2 | 1 mark |

**Question 20**

Work out the following for a trolley placed on a ramp:

(a) The velocity, if the kinetic energy is 9.0J, the mass is 2.0kg and the gravity is 9.8ms-2

(4 marks)

|  |  |
| --- | --- |
|  | 1 mark |
|  | 1 mark |
|  | 1 mark |
| units: ms-1 or m/s | 1 mark |

(b) The potential energy, if the trolley is placed in a box and the height of the ramp is 2m. (4 marks)

|  |  |
| --- | --- |
|  | 1 mark |
|  | 1 mark |
|  | 1 mark |
| units: J or Joules | 1 mark |

**Question 21**

A rock of mass 2 kg is falling through the air. A force of 5 N air resistance acts on the rock.

1. What is the weight force of the rock? (4 marks)

|  |  |
| --- | --- |
|  | 1 mark |
|  | 1 mark |
|  | 1 mark |
| units: N or Newtons | 1 mark |

1. What is the size of the net force acting on the rock? (4 marks)

|  |  |
| --- | --- |
|  | 1 mark |
|  | 1 mark |
|  | 1 mark |
| units: N or Newtons | 1 mark |

1. What will be the size of the acceleration of the rock? (4 marks)

|  |  |
| --- | --- |
|  | 1 mark |
|  | 1 mark |
|  | 1 mark |
| units: ms-2 or m/s2 | 1 mark |

**Question 22**

1. Calculate the work done when:
   1. a force of 25 N moves an object through a distance of 8 metres (4 marks)

|  |  |
| --- | --- |
|  | 1 mark |
|  | 1 mark |
|  | 1 mark |
| units: J or Joules | 1 mark |

* 1. a 6 kg object is lifted from a height of 20 metres to a height of 25 metres. (Assume gravitational field strength is 9.8 N/kg.) (4 marks)

|  |  |
| --- | --- |
|  | 1 mark |
|  | 1 mark |
|  | 1 mark |
| units: J or Joules | 1 mark |

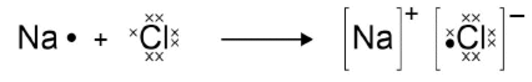
**Question 23**

Draw the electron dot diagram for the following compounds:

1. F2 (2 marks)



1. NaCl (2 marks)



***(1 mark only)***

**Question 24**

Give the name or chemical formula for the following compounds: (6 marks)

1. Magnesium hydroxide ***Mg(OH)2***
2. CO ***carbon dioxide***
3. Ammonium sulfate ***(NH4)2SO4***
4. NH3 ***ammonia***
5. Aluminium oxide ***Al2O3***
6. Sulfuric acid ***H2SO4***

**Question 25**

Balance the following equations: (4 marks)

1. \_\_\_\_\_ Fe + \_\_**2**\_\_\_ AgNO3 🡪 \_\_\_\_\_ Fe(NO3)2 + \_\_**2**\_\_\_ Ag
2. \_\_\_\_\_ S8 + \_\_**8**\_\_\_O2 🡪 \_\_**8**\_\_\_SO2
3. \_\_\_\_\_V2O5 + \_\_**5**\_\_\_ CaS 🡪 \_\_\_**5**\_\_CaO + \_\_\_\_\_V2S5
4. \_\_**6**\_\_\_ AgI + \_\_\_\_\_ Fe2(CO3)3 🡪 \_\_**2**\_\_\_ FeI3 + \_\_**3**\_\_\_ Ag2CO3

**Question 26 (5 marks)**

For each of the following chemical reactions:

* Determine whether a precipitate will form;
* If a precipitate forms, write the chemical formula for this solid. (1 mark)
* Write the balanced ionic equation for those reactions which will produce a precipitate. (1 mark)

(If no precipitate forms write **no reaction**)

1. lead (ll) nitrate and sodium iodide

***precipitate is PbI2 (1 mark)***

***Pb2+ + 2I-🡪 PbI2 (1 mark)***

1. sodium hydroxide and magnesium nitrate

***precipitate is Mg(OH)2 (1 mark)***

***Mg2+ + 2OH-🡪 Mg(OH)2 (1 mark)***

1. ammonium nitrate and potassium phosphate

***no reaction (1 mark)***

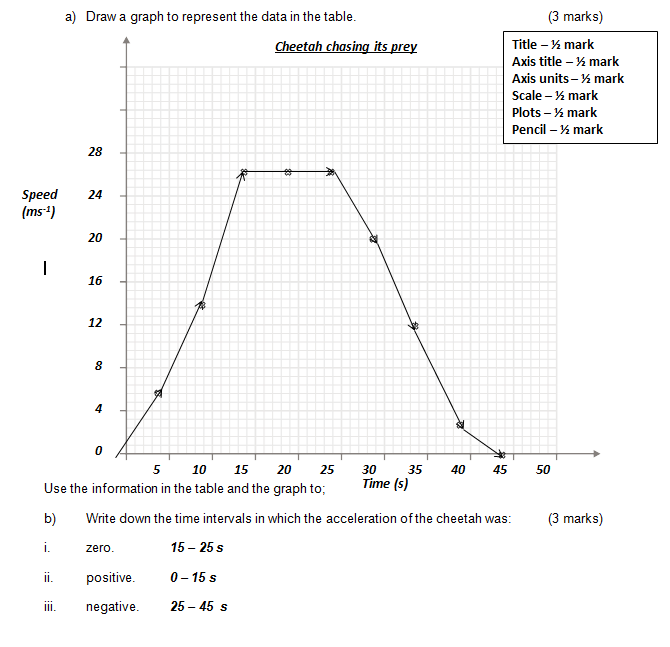
**End of Section Two**

**SECTION THREE: EXTENDED ANSWER SECTION**  **(20 marks)**

**Question 27 Compulsory.**

The table below shows the speed of a cheetah starting at rest and then at 5 second intervals as it chases its prey.

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Time in s | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 |
| Speed in ms-1 | 6 | 14 | 27 | 27 | 27 | 20 | 12 | 3 | 0 |



1. Draw a graph to represent the data in the table. (3 marks)

Use the information in the table and the graph to;

b) Write down the time intervals in which the acceleration of the cheetah was: (3 marks)

i. zero.

ii. positive.

iii. negative.

c) Calculate the acceleration of the cheetah between 25 and 40 seconds. (4 marks)

|  |  |
| --- | --- |
|  | 1 mark |
|  | 1 mark |
|  | 1 mark |
| units: ms-2 or m/s2 | 1 mark |

**Question 28 (10 marks)**

Select **one (1)** of the following questions to write your extended answer. Complete your answer in the spaces provided, including labelled diagrams where appropriate.

**OPTION 1: Chemistry**

Explain the three main types of chemical bonds. Indicate what types of elements are involved with each type of bond. Give the properties of substances that exist with each type of bond and an example of each.

|  |  |  |  |
| --- | --- | --- | --- |
| ***Definitions:***  ***Covalent – electrons are shared***  ***Ionic – one atom donates electron(s) to another***  ***Metallic – sea of mobile electrons*** | | | ***1 mark each = 3 marks*** |
| ***Types of elements:***  ***Covalent – non metals***  ***Ionic – metal and non-metal***  ***Metallic - metals*** | | | ***½ mark each = 1.5 marks*** |
| ***Properties:*** | | | ***1 for each + 1 extra = 4 marks*** |
| ***Covalent –***  ***non-conductor of electricity and heat,***  ***malleable,***  ***solids are soft,***  ***low m.p. & b.p.*** | ***Ionic –***  ***conducts electricity when molten or in solution,***  ***hard but brittle,***  ***high m.p.,***  ***soluble in water*** | ***Metallic –***  ***lustre,***  ***conductor,***  ***malleable,***  ***ductile,***  ***hard (most)*** |
| ***Examples:***  ***Covalent – CO2 or similar***  ***Ionic – NaCl or similar***  ***Metallic – aluminium or similar*** | | | ***½ each = 1.5 marks*** |

**OPTION 2: Evolution**

Charles Darwin promoted the theory of natural selection in his studies of evolution.

Provide a definition for the term ‘natural selection’ and describe its principles by referring to how it would impact on a real species.

Natural Selection occurs when there is a variation/mutation within a gene pool of a population that puts an individual at a survival advantage. (1 mark)

The principles involved are:

1 There are often variations within a population of a species. (1 mark)

2..There are more offspring produced than there are parents. (1 mark)

3. There is competition for resources. (1 mark)

4. Those with a favourable variation are likely to survive. (1 mark)

5. They are more likely to reproduce (1 mark)

6. and pass that characteristic onto their offspring. (1 mark)

7. The trait becomes more characteristic becomes more common in the population. (1 mark)

**The other 2 marks are giving an example of a real species that has under gone natural selection applying the above principles in nature. Not artificial selection by humans.**

Eg. Peppered moth