**Joseph Banks Secondary College**

Year 12 Integrated Science: General

**NAME:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**TASK 7: TEST – Chemical reactions, combustion, corrosion, petrol and batteries.**

**Time allowed for this paper**

Reading time: 5 minutes

Working time for paper: 55 minutes

**Materials required/recommended for this paper**

***To be provided by the supervisor***

This Question/Answer Booklet

Periodic Table

***To be provided by the candidate***

Standard items: pens, pencils (including coloured), sharpener, correction fluid, eraser, ruler, highlighters.

**Task Weighting:**

7.5% of the school mark for this pair of units

**Structure of this paper**

|  |  |  |
| --- | --- | --- |
| **Section** | **Number of questions** | **Marks available** |
| **A**: Multiple choice | 15 | /15 |
| **B**: Short answer | 3 | /27 |
| **C:** Extended response | 1 | /18 |
| **Total** |  | **/60**  **%** |

**Section A: Multiple choice [15 marks]**

**Each question has only one correct answer. Circle the appropriate box to record your answer.**

1. Which of the following is an example of a physical change?
2. A gas being produced when a metal is added to an acid
3. Salt crystals dissolving in water
4. A solid forming when two solutions are added together
5. A temperature increase when a metal is added to water
6. During an acid-metal reaction, the products formed from this reaction are:
7. Carbon Dioxide and Water
8. Metal Salt and Carbon Dioxide
9. Metal Salt and Hydrogen Gas
10. Carbon Dioxide and Hydrogen Gas

1. Which of the following is not a common property of metals?
2. Malleable
3. Dull
4. Ductile
5. Good conductor of heat
6. A composite material is best described as a:
7. combination of materials with different physical properties
8. combination of a solute and solvent
9. mixture of substances
10. combination of two materials with different physical and chemical properties
11. Which of the following are products of a complete combustion reaction?
12. Carbon Dioxide and Carbon Monoxide
13. Carbon Dioxide and Water
14. Water and Carbon Monoxide
15. Oxygen and Carbon Dioxide
16. Which of the following is the balanced chemical reaction for the combustion of Butane?
17. 2C4H10. + 13O2. 🡪 8CO2 + 10H2O
18. 3C4H10. + 11O2. 🡪 12CO2 + 9H2O
19. C4H10. + O2. 🡪 CO2 + H2O
20. 2C4H10. + 12O2. 🡪 7CO2 + 10H2O
21. What is the correct formula for Octane?
22. CH4
23. C18H24
24. NH4H
25. C8H18
26. Which is NOT a sign of a chemical change?
27. Gas production
28. Heat production
29. Dissolving
30. Colour change
31. A solute is:
32. Dissolved in the solvent
33. Used to dissolve a solvent
34. The major component of a mixture
35. Always heterogenous
36. An example of a composite material is:
37. A gold ring
38. Kevlar
39. Sodium Chloride
40. Steel
41. Which of the following are products of an incomplete combustion reaction?
42. Carbon Dioxide and Carbon Monoxide
43. Carbon Dioxide, Water and Carbon
44. Water, Carbon Monoxide and Carbon
45. Oxygen and Carbon Dioxide and Carbon
46. In a car battery the cathode and the anode are what charge.

|  |  |  |
| --- | --- | --- |
|  | CATHODE | ANODE |
| **a)** | Negative | Positive |
| **b)** | Negative | Neutral |
| **c)** | Neutral | Positive |
| **d)** | Positive | Negative |

1. What is the acid that is commonly used in car batteries?
2. Hydrochloric acid
3. Nitric acid
4. Sulfuric acid
5. Citric acid
6. What are the main properties of Carbon Fibre for its requirement in cars?
7. Strong and corrosion resistant
8. Strong, light weight and corrosion resistant
9. Light weight and strong
10. Rigid and conductive.
11. Steel is used in cars for its corrosion resistance, what is the name of this material?
12. Metal
13. Composite
14. Iron
15. Alloy

**Section B: Short answer [27 marks]**

1. **Physical and Chemical Change (9 marks)**
   1. List and explain one example of a physical change. *(2 marks)*

**Substance that:**

* **Dissolves**
* **Forms a mixture**
* **Changes shape**
* **Changes phase**

States one of the above (1), explains one of the above (2)

* 1. Provide three indicators for a Chemical Change? *(3 marks)*

Provides 3 of the following-1 mark for each answer.

* **Change in temperature**
* **Change in colour**
* **Change in odour**
* **Production of bubbles**
* **Production of a precipitate**
  1. 2.5 g of a white powder was in a crucible. It was heated with a Bunsen burner until a liquid and bubbles were produced. After cooling a piece of white solid remained. It weighed 2.0 g. Explain whether this is a physical or chemical change. Give a reason for your answer.  *(4 marks)*

**It is a chemical change (1) because a gas was produced indicated by bubbles (1).**

**Because the gas was lost to the surroundings the mass after the reaction is less (1).**

**This is based on the law of conservation of mass - where the mass before and after the experiment should be the same (1).**

1. Alloy Materials **(8 marks)**
   1. Define an alloy and provide an example. *(2 marks)*

**An alloy is a metal made of a mixture of 2 or more metals or a metal and a non-metal. (1)**

**Examples include steel, stainless steel, brass, bronze (1)**

* 1. For the alloy material you named above in a), provide the composition, a use of this alloy. *(2 marks)*

Any one of the following- (1) for the correct composition (1) and for a use.

* **Steel-contains iron and carbon- used in cars, buildings, railways and bridges.**
* **Stainless steel-contains iron and chromium- used in surgical, dental, medical equipment, and home appliances.**
* **Brass- copper and zinc-used in plumbing, electrical plugs and sockets, locks and hinges, gears and bearings.**
* **Bronze- copper and tin-used in musical instruments, sculptures and medals**
  1. List and describe three properties of this material and explain why it is used in the product you have listed above.  *(4 marks)*

Must include 3 reasons to why it is used (3) and link it back to the product (1).

* **Steel- used in construction where materials are placed on top of each other and must be able to withstand weight. Ideal properties are high strength, can be produced quickly, can be reused and relatively cheap.**
* **Stainless steel-used in medical equipment as it needs to be constantly cleaned and resistant to chemicals and materials. Ideal properties are easily sterilised, corrosion resistant, heat resistant, chemical resistant and high strength.**
* **Brass- Ideal properties are low friction, electrical conductivity, corrosion resistance and high strength.**
* **Bronze- used in sculptures and instruments due to its resemblance to gold, it’s shiny and acoustic properties. Ideal properties are more malleable than copper and zinc, corrosion resistant, colour, lustre, high strength.**

1. Word Equations and Types of Reactions **(10 marks)**

**For questions a) and b) below provide the word and formula equation and identify the type of reaction for each.**

* 1. Zinc (Zn) and Hydrochloric acid (HCl) react to form zinc chloride (ZnCl2) and hydrogen (H2). *(3 marks)*

Word Equation: **Zinc + Hydrochloric acid -> Zinc chloride + Hydrogen (1)**

Formula Equation: **Zn + HCl -> ZnCl2 + H2 (1)**

Type of Reaction: **Acid/Metal Reaction (1)**

* 1. Calcium hydroxide (Ca(OH)2) and sulfuric acid (H2SO4) react to form calcium sulfate (CaSO4) and water (H2O). *(3 marks)*

Word Equation: **Calcium hydroxide + Sulfuric acid -> Calcium sulfate + Water (1)**

Formula Equation: **Ca(OH)2 + H2SO4 -> CaSO4 + H2O (1)**

Type of Reaction: **Neutralisation Reaction (1)**

**For questions c) below, supply the missing chemicals, identify the type of reaction and write down the generic equation for each type of reaction.**

* 1. *(4 marks)*

Magnesium carbonate + Sulfuric acid =>  **Magnesium Sulfate (1**) +  **Carbon dioxide (1)** + Water

Type of Reaction: **Acid/Carbonate (1)**

Generic Equation: **Acid + Metal Carbonate -> Salt + Carbon dioxide + Water (1)**

**Section C: Extended Answer [18 marks]**

1. Second hand data analysis of Fuel- <https://afdc.energy.gov/data/>
   1. Provide the labels missing in the table. *(2 marks)*

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Title: Clean Cities Energy Use Impact by Fuel Type (million GGEs)** | | | | | | | | | | | | | | | |
| **Type of Fuel (1)** | **Energy Used over Time (year) (1)-need units** | | | | | | | | | | | | | | |
| **2004** | **2005** | **2006** | **2007** | **2008** | **2009** | **2010** | **2011** | **2012** | **2013** | **2014** | **2015** | **2016** | **2017** | **2018** |
| CNG | 89 | 56 | 81 | 102 | 104 | 85 | 141 | 167 | 191 | 231 | 293 | 402 | 430 | 426 | 411 |
| Biodiesel | 21 | 47 | 63 | 61 | 74 | 39 | 29 | 70 | 59 | 61 | 59 | 78 | 102 | 94 | 116 |
| E85 | 16 | 26 | 45 | 37 | 37 | 73 | 39 | 49 | 38 | 48 | 51 | 68 | 71 | 86 | 71 |
| LNG | 0 | 8 | 16 | 9 | 14 | 12 | 23 | 28 | 21 | 22 | 34 | 53 | 45 | 47 | 52 |
| Propane | 39 | 32 | 42 | 30 | 25 | 18 | 18 | 19 | 27 | 27 | 32 | 37 | 45 | 44 | 52 |
| Electric | 3 | 2 | 5 | 5 | 4 | 29 | 9 | 16 | 12 | 20 | 27 | 33 | 41 | 26 | 45 |

**Acronyms:**

|  |
| --- |
| CNG: Compressed natural gas |
| E85: 85% ethanol, 15% gasoline |
| LNG: Liquefied natural gas |

GGEs= gasoline gallon equivalents

* 1. Provide the following variables from the table above: *(4 marks)*

Independent Variable: 2 of the following

**The type of fuel (CNG, Biodiesel, E85, LNG, Propane and Electric) (1) and the Time (1) measured using the year (1).**

Dependent Variable: **Energy used (1)- million gasoline gallon equivalents is the unit (1).**

* 1. Provide one controlled variable that must have been followed for the data above to be collected and explain why they need to be controlled. *(2 marks)*

Any 1 of the following:controlled variable (1) and reason (1)

* **The city and country the data is collected. (1) each location around the world would use different amount of each energy depending on number of people, energy sustainability etc. (1)**
* **The length of each year, same number of days. (1) need to make sure you measure the total amount of energy used over the same period of time , same start and end date. (1)**
  1. Create an appropriate graph to represent the data in the table above. Only include electric and Biodiesel in the graph. *(6 marks)*

1 mark for each of the following:

* **Correct title incorporating independent and dependent variable.**
* **Correct Labels with units**
* **Correct scale**
* **Correct axis of independent and dependent variables.**
* **Key**
* **Correctly plotted data.**

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* 1. Using the graph above describe the trends observed and provide an explanation for the results.

*(4 marks)*

**From 2004 to 2018 there is a positive trend with both fuels increasing in the amount used (1).**

**Uses data from the table to support this statement (1).**

**Population increases so the amount of fuel used will increase (1).**

**The need for more cleaner energy use in the environment so all increase (1).**

**END OF TEST**