Province of the
**EASTERN CAPE**
EDUCATION

## SENIOR PHASE

## GRADE 9

## NOVEMBER 2012

## TECHNOLOGY

MARKS:          100

TIME:          2 hours

This question paper consists of 16 pages.

**INSTRUCTIONS AND INFORMATION**

1.    This question paper consists of FIVE SECTIONS: SECTIONS A, B, C, D, and E.

2.    Answer ALL the questions from SECTIONS A, B, C, D, and E.

3.    Read ALL the questions carefully before you write the answers.

4.    Number your questions exactly as they appear in the question paper.

5.    Write neatly and legibly.

6.    Sketches must be clear, neat and done in pencil.

### ALLOCATION OF MARKS

| SECTION A | MULTIPLE-CHOICE QUESTIONS | | |
|---|---|---|---|
| | QUESTION 1 | | [15] |
| SECTION B | STRUCTURES | | |
| | QUESTION 2 | | [10] |
| SECTION C | PROCESSING | | |
| | QUESTION 3 | | [10] |
| SECTION D | SYSTEMS AND CONTROL (Mechanical Systems) | | |
| | QUESTION 4 | | [33] |
| SECTION E | SYSTEMS AND CONTROL (Electrical Systems) | | |
| | QUESTION 5 | (14) | [32] |
| | QUESTION 6 | (18) | |

**SECTION A:  MULTIPLE-CHOICE QUESTIONS**

**QUESTION 1**

1.1    Choose the correct answer and write only the letter (A – D) next to the question number (1.1.1 – 1.1.10) in your answer book, for example 1.1.11  D.

1.1.1    A good example of this force is seen in a pair of scissors.  The two handles exert forces in a different direction on the pin holding the blades together.

A    Tension force
B    Shearing force
C    Twisting force
D    Compression force                                                     (1)

1.1.2    A beam which is supported at one end only is known as ...

A    clapper bridge.
B    suspension bridge.
C    arch bridge.
D    cantilever bridge.                                                    (1)

1.1.3    These types of loads cause vibrations and they fluctuate (change all the time).

A    Dynamic
B    Static
C    Beam
D    Flexible                                                             (1)

1.1.4    Which ONE of the following additives is used to prevent ingredients from clumping together?

A    Flavouring
B    Colourant
C    Anti-caking agents
D    Antioxidants                                                         (1)

1.1.5    A mixture of two or more metals to improve the properties.

A    Alloy
B    Perspex
C    Tinplate
D    Sulphur                                                              (1)

1.1.6   Two pulley systems that are connected to one another with a belt are known as ...

A   gears.
B   belt drives.
C   rack and pinion.
D   spur gears.                                                     (1)

1.1.7   This is used to lock a mechanism safely when it is holding a load.

A   Pulley
B   Gear
C   Lever
D   Ratchet                                                        (1)

1.1.8   ... are usually attached to the ropes of a flagpole.

A   Ratchets
B   One way valve
C   Cleats
D   Force                                                          (1)

1.1.9   Ohmmeters are used to measure the ... in a circuit.

A   energy
B   resistance
C   voltage
D   current                                                        (1)

1.1.10  This is the type of resistor whose resistance changes as the light intensity falling on it changes.

A   Thermistor
B   Capacitor
C   Transistor
D   Light-Dependant Resistor (LDR)                                 (1)

1.2     Give ONE word for the following statements.

        1.2.1     The process of destroying micro-organisms by removing moisture from food     (1)

        1.2.2     The process of applying a liquid that dries to form a shiny layer of coating on wood     (1)

        1.2.3     The process in which a very low temperature stops micro-organisms from multiplying and growing     (1)

        1.2.4     The process of producing a thin metallic coating on the surface of a metallic object, using electricity     (1)

        1.2.5     The process in which radio-active beams that kill micro-organisms are passed through the food     (1)

**TOTAL SECTION A:**     **15**

## SECTION B:  STRUCTURES

## QUESTION 2

2.1    Read the following information and then answer the questions that follow.

**The Nelson Mandela Bridge**

The Nelson Mandela bridge is a 'cable-stayed' bridge built in 2003 in Johannesburg. It is the longest cable-stayed bridge in the country.  Its design allowed construction to continue without any disruption to traffic because the bridge was built from both sides and the cables supported the growing bridge as the two sides grew towards each other. During the construction jobs were created and the following concerns were considered:

-   Safety of construction workers
-   Safety of the community
-   Use of local labour
-   Cost and time

The bridge is strong and rigid enough to carry the load.



**The Nelson Mandela Bridge**

2.1.1    Give ONE concern that builders should consider during the construction phase.                                                          (1)

2.1.2    List TWO possible materials that can be used in the construction of a bridge.                                                                  (2)

2.1.3    What types of load will the bridge carry that must be considered during the design phase?                                              (1)

2.1.4    Name ONE type of force that will act on the bridge throughout its life.    (1)

2.2    Identify the structural parts used to strengthen each of the following
       structures.

       Write down the numbers 1 – 5 and the correct name of the structural part
       next to each number.
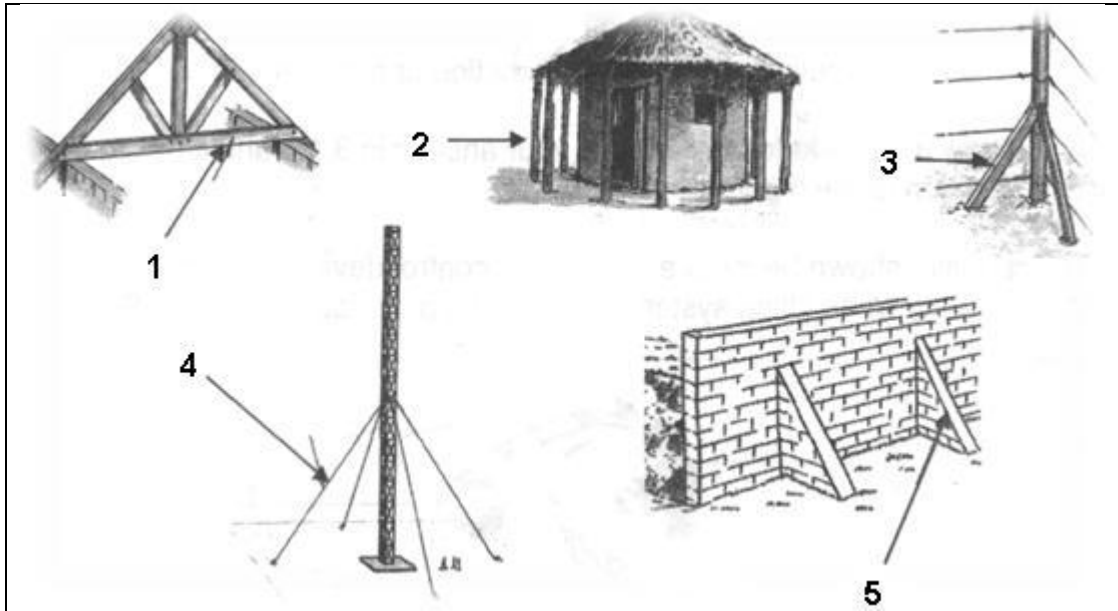


                                                                    (5 x 1)    (5)

                                              **TOTAL SECTION B:    10**

**SECTION C:  PROCESSING**

**QUESTION 3**

3.1   Read the following article and answer the questions that follow.

| **Case Study: Food additives affect behaviour** |
|---|
| On average 30% of foods in our diet are processed foods.  Many processed foods have to be enriched by adding inorganic minerals and vitamins to compensate for the nutrition lost in the processing of food.  There has been an increase in Attention Deficit Disorder and behavioural problems in schools.  Adults are now getting symptoms of Alzheimer's more quickly than before.  Food colourings in juices, cereals, snacks and vitamin supplements affect the functioning of the nervous system.  Children exhibited constant crying tantrums, irritability, restlessness and severe sleep disturbance when affected by food colouring.

When food additives are added to natural foods both physical and behavioural problems can occur.  The three most common symptoms found when we get too many food additives are headaches, anxiety and upset stomachs.  Common food additives to watch out for, besides food colourings are preservatives, artificial sweeteners and caffeine.  Preservatives are found in all processed foods and even in some of the natural foods such as fruits and vegetables.  What children eat during their growing has a great effect on the way they think, learn and act. |

3.1.1   Name ONE reason why food manufacturers add inorganic minerals and vitamins to food. (1)

3.1.2   Give ONE negative behavioural effect of additives in children. (1)

3.1.3   Mention ONE of the common symptoms we get from food additives. (1)

3.1.4   Which food additives do we need to be careful of besides food colouring?  Give ONE. (1)

3.1.5   Name ONE disadvantage of processed food. (1)

3.2 Match the food processing methods in COLUMN A with the correct description in COLUMN B. Write only the number of the process in COLUMN A and the letter of the correct description in COLUMN B next to it.

| | COLUMN A | | COLUMN B |
|---|---|---|---|
| 3.2.1 | Salting | A | The acid in the vinegar prevents the growth of micro-organisms |
| 3.2.2 | Canning | B | Allows food to be stored for longer periods |
| 3.2.3 | Freezing | C | Heating foods in airtight, vacuum-sealed containers |
| 3.2.4 | Pickling | D | Chemicals in the smoke prevent the growth of micro-organisms |
| 3.2.5 | Smoking | E | Killing of micro-organisms by means of salt |

(5 x 1) (5)
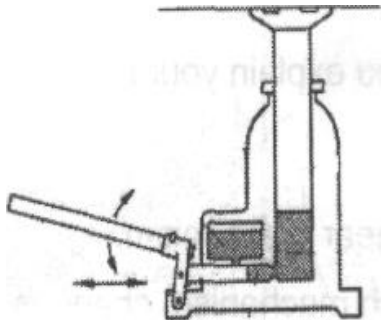
**TOTAL SECTION C:** **10**

**SECTION D:  SYSTEMS AND CONTROL (MECHANICAL SYSTEMS)**

**QUESTION 4**

4.1    All machines consist of simple mechanisms.  For a mechanical system to
       work, there must be an INPUT that undergoes a PROCESS in order to
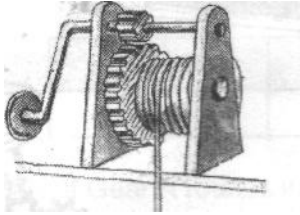       produce an OUTPUT.

       Example:
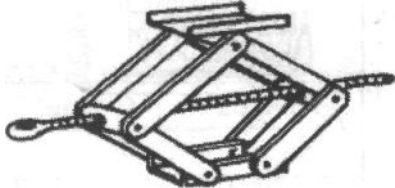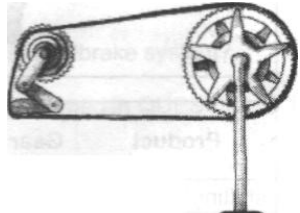
| | Input | Process | Output |
|---|---|---|---|
|   Hydraulic car jack → | Person pushes and pulls the handle of the jack | The hydraulic fluid moves | The jack lifts the car |
| | → | → | → |

       Study the following diagrams and complete the following table by explaining
       how Input and Output occurs:

| Name of object | Input | Output |
|---|---|---|
|   Car jack | | |
|   Scissors | | |
|   Whisk | | |

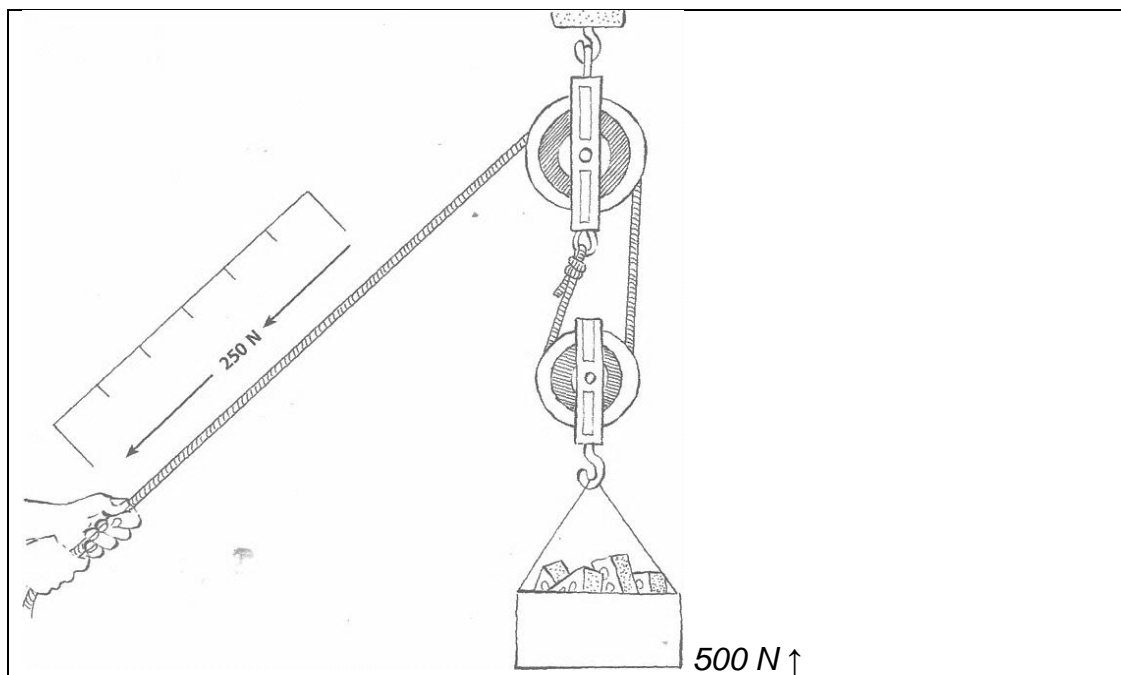| | | |
|---|---|---|
|  Hand-driven pulley winch | | |
|  Bicycle's gear system | | (10) |

4.2 Answer the following questions:

4.2.1 What is a pulley? (1)

4.2.2 In what way does a pulley system make work easier? (1)

4.3 The following diagram shows a person using a compound pulley system to lift the bricks.



A compound pulley system

4.3.1 Calculate the mechanical advantage of this pulley system. (3)

Formula:

$$\text{Mechanical Advantage} = \frac{Load}{Effort}$$

4.3.2 How will you reverse the rotational direction of a driven pulley? (1)

4.3.3 Draw a neat sketch to illustrate your answer. (4)

4.4 Gears are used in most machines that work in the construction industry. A bicycle is driven by a chain that transfers power from the pedals to a smaller cog at the centre of the rear wheel.

The diagram below shows a bicycle gear-set that allows six different speeds.
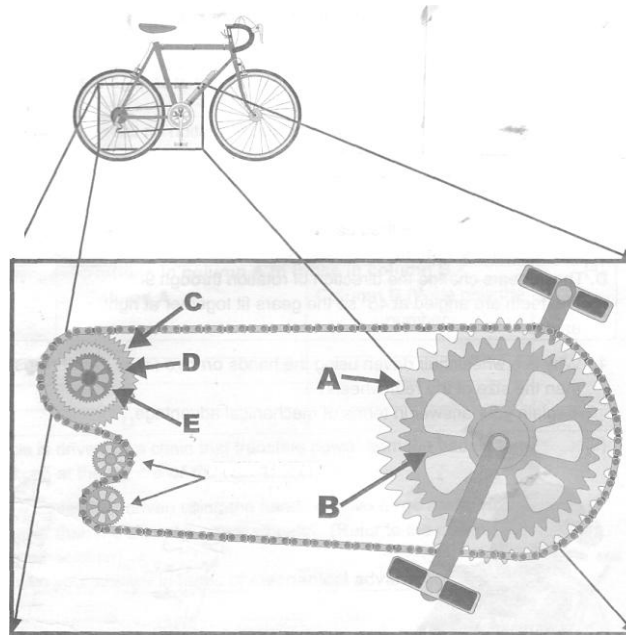


| Gear | No. of teeth |
|------|--------------|
| A | 45 |
| B | 40 |
| C | 25 |
| D | 20 |
| E | 15 |

The chain can be driven by either of the large chain wheels, A or B, and it can also drive each of the smaller rear wheel sprockets C, D or E.

With this gear-set the six different speed ratios are:

A:C  A:D , A:E , B:C,  B:D ,  and  B:E

4.4.1 Which of the SIX ratios would be best for climbing steep hills? (1)

4.4.2 Which ratio would be best for maximum speed on a level road? (1)

4.4.3 What is the purpose of the spring-loaded sprockets? (1)

4.5 Match the description in COLUMN A to those in COLUMN B. Write only the letter in COLUMN A next to its matching number in COLUMN B.

| | COLUMN A | | COLUMN B |
|---|---|---|---|
| 4.5.1 | Wheels with teeth that mesh with each other. They change the speed and direction of a rotating shaft | A | Bevel gears |
| 4.5.2 | These gears work on the screw principle. A rotation on the screw wheel causes a much slower rotation on the toothed wheel. The input and output shafts are also at 90° to each other | B | Spur gears |
| 4.5.3 | A gear wheel and a toothed bar to change a rotary movement into a linear movement | C | Rack and pinion |
| 4.5.4 | These gears change the direction of rotation through 90°. The teeth are angled at 45° so the gears fit together at right angles | D | Worm gears |

(4)

4.6 The illustration below shows a compound gear train consisting of four gears. Look at the diagram and answer the questions that follow.
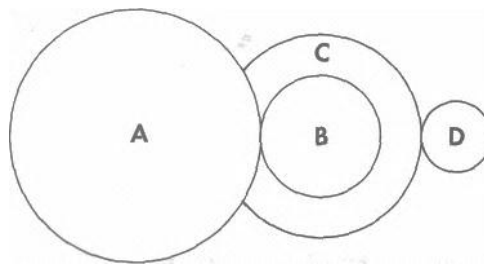


This table indicates the number of teeth of each gear.

| Gear A | Gear B | Gear C | Gear D |
|---|---|---|---|
| 120 teeth | 40 teeth | 80 teeth | 20 teeth |

4.6.1 Gear A rotates in a clockwise direction at 30 revolutions per minute. What is the output in revolutions per minute in gear D? (5)

e.g. $\dfrac{A}{B} = \dfrac{120}{40} = 3$

30 revolutions x 3 = 90 revolutions per minute at B.
(C is fixed to B and therefore rotates at the same speed.)
Now calculate the output in revolutions per minute in gear D.

4.6.2 What is the direction of rotation at gear D? (1)

**TOTAL SECTION D:    33**

**SECTION E:  SYSTEMS AND CONTROL (ELECTRICAL SYSTEMS)**

**QUESTION 5**

5.1 The table below shows electrical components with their symbols and function.  Copy the table in your answer book and fill in the missing parts 1 – 11.

| Component | Symbol | Use |
|---|---|---|
| Batteries |  | Batteries supply the energy to make the circuit work |
| 1 |  | A push switch turns the flow of current on or off. The current will flow only while the switch is being pressed. |
| Resistors | 2 | 3 |
| 4 |  | 5 |
| Light-Dependant Resistor (LDR) | 6 | 7 |
| 8 | 9 | Change electrical energy into movement. The electricity makes the component turn. We can then use the component to make other things move. |
| Buzzer | 10 | 11 |

(11)

5.2 Read the following scenario and answer the questions that follow.

> Mr Bumnandi owns a fish tank which has a light installed to keep the water warm. He wants an electrical system that will automatically switch the light on when it is dark, and also switch the circuit on and off when the water becomes too hot or too cold.

    5.2.1 What will happen if the water becomes too hot, or too cold? (1)
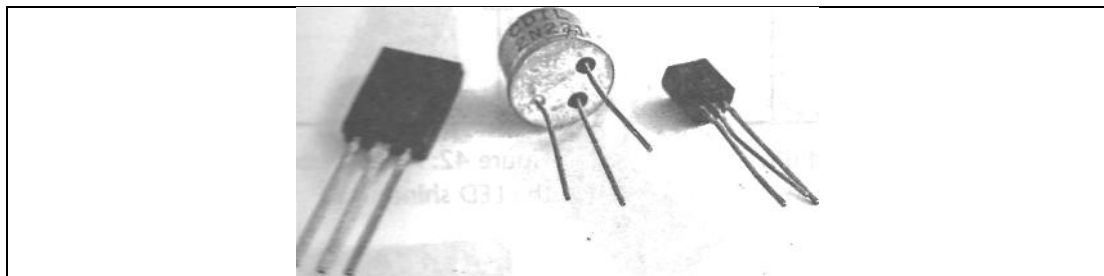
    5.2.2 What electronic device is needed to switch lights automatically on when it gets dark? (1)

    5.2.3 What electronic device is needed to switch the circuit on and off when the water is too hot, or too cold? (1)

**[14]**

## QUESTION 6

6.1 The sketch below shows an example of a processing device used in many different circuits.
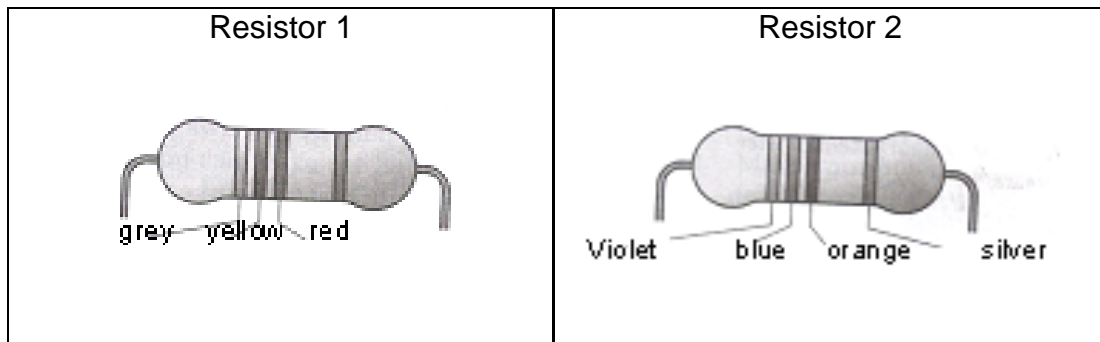


    6.1.1 Name this device. (1)

    6.1.2 Give TWO basic functions performed by this device. (2)

    6.1.3 Mention the THREE terminals found in this device. (3)

6.2 Look at the following colour code chart and work out the resistance of the resistors below:

| Colour | 1st Band | 2nd Band | 3rd Band | 4th Band |
|--------|----------|----------|----------|----------|
| Black | 0 | 0 | | |
| Brown | 1 | 1 | 0 | |
| Red | 2 | 2 | 00 | Accuracy/ |
| Orange | 3 | 3 | 000 | Tolerance |
| Yellow | 4 | 4 | 0000 | |
| Green | 5 | 5 | 00000 | Gold = ± 5 % |
| Blue | 6 | 6 | 000000 | Silver = ± 10 % |
| Violet | 7 | 7 | 0000000 | None = ± 20 % |
| Grey | 8 | 8 | 00000000 | |
| White | 9 | 9 | 000000000 | |

| Resistor 1 | Resistor 2 |
|---|---|
|  grey — yellow — red |  Violet    blue   orange    silver |

6.2.1 What is the resistance of resistor 1? (3)

6.2.2 What is the resistance of resistor 2? (3)

6.3 State the colours found in the following resistors:

6.3.1 750 000 Ω (3)

6.3.2 80 Ω (3)

**[18]**

**TOTAL SECTION E:** **32**
**GRAND TOTAL:** **100**