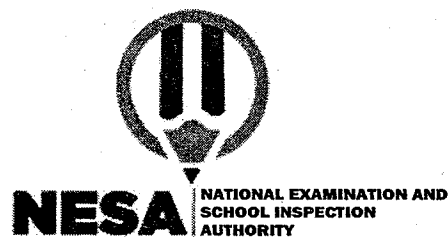


**INTEGRATED SCIENCE: Content
Knowledge & Teaching Methods**

INS 01

21/07/ 2021

2:00 PM to 5:00 PM



TTC NATIONAL EXAMINATIONS, 2020-2021

**SUBJECT: INTEGRATED SCIENCE: Content Knowledge &
Teaching Methods**

OPTION: EARLY CHILDHOOD AND LOWER PRIMARY EDUCATION (ECLPE)

DURATION: 3 HOURS

INSTRUCTIONS:

- 1) Write your names and index number on the answer booklet as written on your registration form, and **DO NOT write** your names and index number on additional answer sheets if provided.
- 2) Do not open this question paper until you are told to do so.
- 3) This paper consists of **three sections: A, B and C.**
 - **Section A:** Attempt **all** questions. **(50 marks)**
 - **Section B:** Attempt any **three** questions. **(30 marks)**
 - **Section C: Methodology** (Attempt **all** questions) **(20 marks)**
- 4) Use a **blue** or **black** pen.
- 5) Graphs must be drawn on graph paper provided

SECTION A: ATTEMPT ALL QUESTIONS (50 marks)

1) Choose the number that corresponds to the correct answer

a) By using prefix, you can write 335×10^{-8} s as

- (i) 0.335 ms
- (ii) 33.5 ps
- (iii) 3.35 μ s
- (iv) 335 ns

(1 mark)

b) Which of the physical quantities below is a derived quantity?

- (i) Distance
- (ii) velocity
- (iii) amount of substance
- (iv) Thermodynamic temperature

(1 mark)

c) The dimensional formula of Force is:

- (i) $[MLT^{-2}]$
- (ii) $[ML^2T^{-1}]$
- (iii) $[MLT]$
- (iv) $[MLT^{-1}]$

(1 mark)

d) Which list contains only scalar physical quantities?

- (i) Acceleration, displacement, velocity
- (ii) Distance, force, speed
- (iii) Force, length, time
- (iv) Length, mass, pressure

(1 mark)

2) a) Assume that a car is moving at 90 km/h west.

What is the speed of the car in m/s?

(1 mark)

b) If a car increases its velocity from 10 m/s to 30 m/s in 40 s. What is its acceleration?

(2 marks)

3) a) What will happen to the electric force between two electric charges if the distance between them is doubled ?

(1 mark)

b) An electric battery of 12 V with negligible internal resistance, a resistor of $24\ \Omega$ and an ammeter are connected in series.

What does the ammeter read?

(2 marks)

4) In alternating current circuit, the potential difference V and the electric current I are given by $V = 50 \sin 40t$ in volts and $I = 100 \sin(40t + \pi/3)$ in amperes.

a) Do V and I have the same frequency?

How do you know?

(2 marks)

b) Determine the maximum value of the potential difference.

(1 mark)

5) Complete each of the following statements by using appropriate term.

Write only the answer in your answer booklet and don't copy the whole statement.

a) Whenis conserved, the kinetic energy, an object ends up with in free fall always equals the gravitational potential energy it starts with when it is released from rest.

(1 mark)

b) Doing the same amount of work in less time requires a greater

..... output.

(1 mark)

c) Aacting in the direction an object is moving does positive work.

(1 mark)

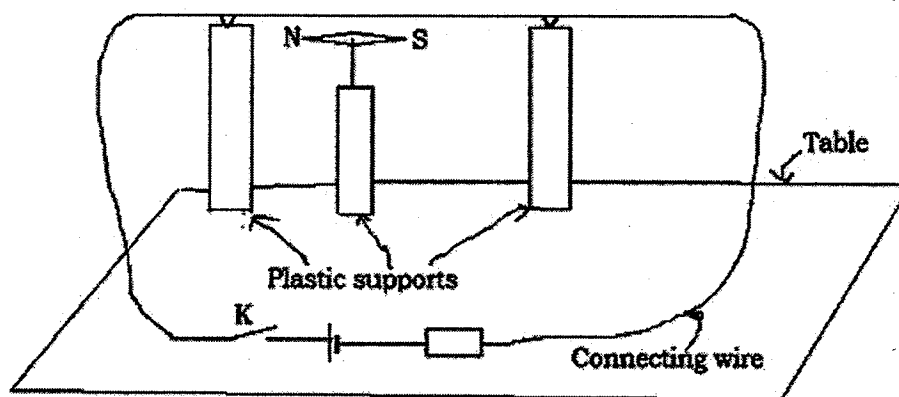
d) A flagpole is an example of a type of simple machine called...

.....

(1 mark)

6) a) List any one method of magnetization. **(1 mark)**

b) The compass needle magnet and an electric circuit are shown below:



Predict what will happen to the compass needle if the switch K is closed.
Explain your answer. **(2 marks)**

7) Describe the following properties of waves:

a) Reflection of waves. **(1 mark)**

b) Interference of waves. **(1 mark)**

8) Determine the type of semiconductor obtained when an intrinsic semiconductor called germanium is doped with trivalent impurity.

Explain this doping process. **(3 marks)**

9) a) State two methods that can be used to prevent pollution of water. **(2 marks)**

b) Describe one danger of leakage of artificial fertilisers in rivers. **(1 mark)**

10) a) Calculate the percentage composition by mass of zinc (Zn) element in 1 mole of $\text{ZnSO}_4 \cdot 7\text{H}_2\text{O}$ **(2 marks)**

(Atomic mass: Zn=65, S= 32, H=1, O=16)

b) Magnesium with the mass of 7.2 g reacts with water vapour according to the following equation: $2\text{Mg}_{(\text{s})} + 2\text{H}_2\text{O}_{(\text{g})} \rightarrow 2\text{Mg}(\text{OH})_{2(\text{aq})} + \text{H}_{2(\text{g})}$

(i) Calculate the number of moles of magnesium in 7.2 g of Mg. **(2 marks)**

(ii) Determine the number of moles of H_2 gas produced. **(1 mark)**

(iii) Calculate the volume of H_2 produced at 25°C under 1 atmosphere of pressure. **(2 marks)**

(1 mole of a gas occupies 24 dm^3 at 25°C and 1 atmosphere of pressure)

(Atomic mass: Mg =24)

11) Describe the role of Centrioles in animal cell. **(3 marks)**

12) In each of the following, name the organelle being referred to:

(i) Possesses structure called cristae. **(1 mark)**

(ii) Contain chromatin. **(1 mark)**

(iii) Synthesises glycoproteins. **(1 mark)**

(iv) Digest worn out organelle. **(1 mark)**

13) Describe how enzymes take part in chemical reactions. **(4 marks)**

14) Explain why enzymes function less well at lower temperatures. **(3 marks)**

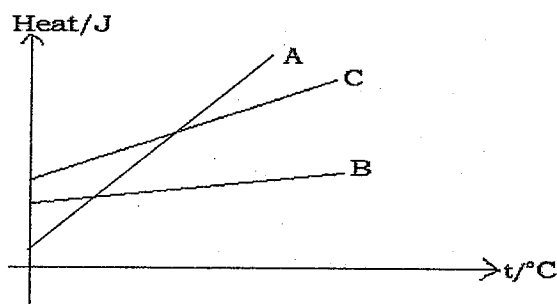
15) Name the test that is used to test for proteins. **(1 mark)**

SECTION B: ATTEMPT ANY THREE QUESTIONS (30 marks)

16) a) What do you understand by the term specific heat capacity of a substance?

(2 marks)

c) (i) The graph given below shows the relation between amounts of heat and change in the temperatures of the three matters A,B,C having same masses.



Compare:

a. The specific heat capacities of A and C. **(1 mark)**

b. The specific heat capacities of A and B. **(1 mark)**

c. The specific heat capacities of C and B. **(1 mark)**

(ii) Identify any three effects of heat on a substance. **(3 marks)**

- d) Find the temperature of the mixture of water, if two cups of water having masses $m_1 = 150 \text{ g}$ and $m_2 = 250 \text{ g}$ and temperature $t_1 = 30^\circ\text{C}$ and $t_2 = 75^\circ\text{C}$ respectively are mixed in an isolated system in which there is no heat lost.

The specific heat capacity of water is $4200 \text{ J/kg } ^\circ\text{C}$. **(2 marks)**

- 17) a) State any two different examples that prove the rectilinear propagation of light. **(2 marks)**

- b) Do the following characteristics of light change during refraction?

Use yes or no

- (i) Speed of light. **(1 mark)**
- (ii) Frequency of light. **(1 mark)**
- (iii) Wavelength of light. **(1 mark)**
- c) (i) With the help of a ray diagram, explain how a magnifying lens also called simple microscope works **(3 marks)**
- (ii) A ray of light in air is incident on an air to glass boundary at an angle of 30° with the normal.

The index of refraction of the glass is 1.65.

Determine the angle of refraction that the refracted ray within the glass forms with the normal. Refractive index of air is 1. **(2 marks)**

- 18) a) Briefly describe the type of bonds in MgO . **(2 marks)**

- b) State 2 differences in physical properties of metal and non-metal. **(2 marks)**

- c) (i) State 2 differences between organic and inorganic compounds. **(2 marks)**

- (ii) Write the balanced chemical equation (use molecular formulae) for the reaction of complete combustion of propane, C_3H_8 in excess air **(1 mark)**

(iii) Write a balanced chemical equation (use molecular formulae) for the reaction between pent-2-ene and H_2O in concentrated H_2SO_4 to give the products of the reaction. **(1 mark)**

(iv) You are given solution X that contains ethane, CH_3CH_3 and Z which contains propene $\text{CH}_3\text{CH}=\text{CH}_2$.

Give a reagent test you can use to distinguish between X and Z and state the observable change in each case. **(2 marks)**

19) C_6H_{14} is an organic compound which is a member of the homologous series of alkanes.

a) Write the IUPAC name of C_6H_{14} compound with a branched chain.

(1 mark)

b) Write the semi-developed formula of an alkane with 8 carbon atoms.

(1 mark)

c) Alkanes are aliphatic hydrocarbons.

State 2 uses of alkanes on a large scale.

(2 marks)

d) An alcohol has the molecular formulae of $\text{C}_4\text{H}_{10}\text{O}$:

(i) Write a formula of the functional group in alcohols.

(1 mark)

(ii) Write a structural formulae of two possible isomers of $\text{C}_4\text{H}_{10}\text{O}$ alcohol.

(2 marks)

e) Consider the following chemical species and their symbols: Mg^{2+} , Cl_2 .

(i) Write the electronic configuration of Mg^{2+} in terms of s, p, d and f notation.

(1 mark)

(ii) Write a balanced chemical equation of the reaction between magnesium, Mg and chlorine, Cl_2

(2 marks)

(Atomic number: $\text{Mg}=12$, $\text{Cl}=17$)

20) a) Describe the activities of digestion which occur in each of the following parts of the alimentary canal.

(i) Stomach (4 marks)

(ii) Ileum (6 marks)

21) Describe the activities which

(i) add carbondioxide to the atmosphere. (4 marks)

(ii) remove carbondioxide from the atmosphere. (6 marks)

SECTION C: TEACHING METHODOLOGY: this section is compulsory (20 marks)

22) The contemporary approach of teaching science confirms that there are situations where lecture method can be used. But when used, it should be very brief. Emphasize five (5) different situations where the lecture method would be appropriate. (10 marks)

23) The following instructional objectives are not well stated. Give reasons why and rewrite them correctly. (10 marks)

a) The teacher will add two numbers with sum not greater than 10.

b) Learners will be able to identify three solids by name.

c) Learners will be able to discover how to arrange three or four numbers in order of size.

d) Learners will be able to know the importance of plants.

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