MACHAKOS UNIVERSITY

University Examinations for 2019/2020 Academic Year

SCHOOL OF PURE AND APPLIED SCIENCES

DEPARTMENT OF PHYSICAL SCIENCE

FIRST YEAR THIRD SEMESTER EXAMINATION FOR

ARTISAN IN FOOD AND BEVERAGE (TVET)

ARTISAN GARMENT MAKING

ARTISAN ELECTRICAL INSTALLATION

ARTISAN MOTOR VEHICLE

SCIENCE

DATE: 14/12/2020 **TIME: 2.30-5.30 PM**

INSTRUCTIONS

This paper consists of seven questions, answer any five questions.

QUESTION ONE

a) Define the following terms (3 marks)

i) Sound

ii) Echo

b) State four sources of sound (4 marks)

c) State and explain three factors affecting velocity of sound in air (6 marks)

d) Explain why the walls of broadcasting studios and concert halls are made of cotton materials (2 marks)

e) State three applications of pulse-echo technique (3 marks)

QUESTION TWO

a) Define the following terms (5 marks)

i) Work

ii) Power

iii) Machine

iv) Force

v) Mechanical advantage

b) Give the mathematical expression for mechanical advantage. (2 marks)

c) State the law of conservation of energy (2 marks)

d) A person weighing **500N** takes **4 seconds** to climb upstairs to a height of **3.0m**. what is the average power in climbing up the height? (5 marks)

e) An electric motor rated **2.5kw** is used to lift bale of hay to a store in a dairy farm. A single bale has mass of **5kg**. If the store is **4 meters** above the ground, how many bales can the motor raise in **2 minutes**? (6 marks)

QUESTION THREE

a) Define alloy. (1 mark)

b) State the composition of the following alloys (5 marks)

i. Brass

ii. Bronze

iii. Steel

iv. Cupronickel

v. Sterling silver

c) State uses of alloys. (5 marks)

d) With the aid of word equations explain the three important reactions take place in the blast furnace. (9 marks)

QUESTION THREE

a) A disc siren with **100** holes is rotated at constant speed making **0.20** revolutions per second. If air is blown towards the holes, calculate;

i. The frequency of the sound produced (3 marks)

ii. The wavelength of the sound produced, if velocity of sound in air is **340m/s** (3 marks)

b) State the law of reflection of sound and explain how an echo is produce (4 marks)

c) The speed of sound in air **340m/s**. A loud speaker placed between two walls **A** and **B**, but nearer to wall **A** than **B**, is sending out constant sound pulses. How far is the speaker from wall **B** if it is **200m** from wall A and the time between the two echoes received is **0.176** seconds? (10 marks)

QUESTION FOUR

a) State five sources of energy (5 marks)

b) State three renewable resources (3 marks)

d) State three non-renewable resources (3 marks)

e) State three forms of energy (3 marks)

f) Calculate work done by a stone mason in lifting a stone of mass **15kg** through a height of 2.0m ($Take\ g = 10Nkg^{-1}$) (3 marks)

g) A force of **7.5N** stretches a certain spring by **5cm**. How much work is done in stretching this spring by **8.0cm?** (3 marks)

QUESTION FIVE

a) Define the following terms (4 marks)

i) Acid

ii) Alkali

iii) PH

b) State three common acids (3 marks)

c) State three areas where acids are found (3 marks)

d) State five properties of acids and bases (5 marks)

e) State five uses of oxygen (5 marks)

QUESTION SIX

a) Define friction (1 mark)

b) State five laws of friction (5 marks)

c) State four methods of minimizing friction (4 marks)

d) State four applications of friction (4 marks)

e) A block of metal with a mass of 20kg requires a horizontal force of 50N to pull it with uniform velocity along a horizontal surface. Calculate the co-efficient of friction between the surface and the block. (Take g=10m/s) (4 marks)

f) A wooden box of mass 30kg rests on a rough floor and the box is 0.6. calculate the force required to just move the box. (2 marks)

QUESTION SEVEN

a) State four steps for qualitative analysis (4 marks)

b) Define the following terms (4 marks)

i) filtration

ii) crystallization

iii) sublimation

iv) chromatography

c) How the process of filtration can run smoothly? (3 marks)

d) State the principle of crystallization (2 marks)

e) Differentiate between the mobile phase and the stationary phase (6 marks)

f) State the uses of chromatography (3 marks)