Candidate's Name: .....Index No:...../.....

School: .....

535/1

PHYSICS
Paper 1
JUNE 2023
$2\frac{1}{4}$ **hours**

MATIGO EXAMINATIONS BOARD

PRE MOCK 2023

Uganda Certificate of Education

PHYSICS

Paper 1

2 hours 15 minutes

INSTRUCTIONS TO CANDIDATES:

Attempt **ALL** *questions in section* ***A*** *and* ***B****.*

This paper contains ***40*** *objective type questions. You are required to write the correct answer* ***A, B, C*** *or* ***D*** *against each question in the box on the right hand side of each question. Section* ***B*** *has 10 structured questions. Answers to this should be written in the spaces provided.*

Assume the following where necessary;

- *Acceleration due gravity,* $g = 10\ ms^{-2}$
- *Specific heat capacity of water* $= 4200\ J\ kg^{-1}\ K^{-1}$
- *Specific heat capacity of ice* $= 2100\ J\ kg^{-1}\ K^{-1}$
- *Specific latent heat of vaporization of water* $= 2{,}260{,}000\ J\ kg^{-1}$
- *Specific latent heat of fusion of water* $= 340{,}000\ J\ kg^{-1}$
- *Speed of sound in air* $= 330\ m\ s^{-1}$
- *Density of water* $= 1000 kgm^{-3}$

Turn Over

SECTION A: (40 MARKS)

1. When a beam of alpha particles was fired at a thin gold film, some of the particles were considerably deflected. This experiment shows that;

A. Alpha particles are very light
B. Electrons in the gold nucleus attract alpha particles
C. A gold nucleus is concentrated in a small volume
D. Electrons in the gold nucleus attract alpha particle

2. A small electric lamp when placed at the focal point of a converging lens will produce.

A. Parallel beam of light
B. Converging beam of light
C. Diffuse beam of light
D. Diverging beam of light

3. The property which distinguishes longitudinal waves from transverse waves is;

A. The wave length
B. The Velocity
C. The ability to be refracted
D. The relative directions of oscillation and propagation

4. When you step from a roaring boat, the boat moves in the opposite direction with;

A. Greater force
B. Less force
C. An equal force
D. No force

5. A thermopile is an instrument which converts;

A. Heat energy to electrical energy
B. Electrical energy to light energy
C. Light energy to electrical energy
D. Chemical energy to heat energy

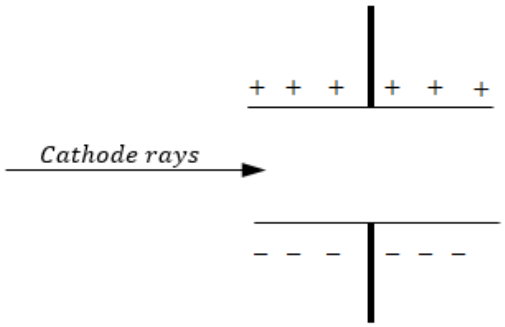
6. A machine of velocity ratio 5 is used to raise a load whose weight is 200N. If the efficiency of the machine is 80%, the effort required is;

A. 50N
B. 25N
C. 80N
D. 60N

7. The distance between the lower fixed point and upper fixed points on the Celsius scale in unmarked mercury in glass thermometer is 25cm. If the mercury level is 5cm below the upper fixed point, then the temperature is;

A. 5℃ C. 20℃ B.80℃ D. 95℃

8. A beam of cathode rays is passed through an electric field between two parallel plates.



In which direction is the beam deflected;

A. Into the page
B. Out of the page
C. Towards the bottom plate
D. Towards the top plate

9. An enclosed mass of a gas occupies $4\ x\ 10^{-3}m^3$ at a pressure of 100kPa. Calculate the volume of the gas when the pressure changes to 80kPa at a constant temperature

A. 2.2×10^{-3} C. 5.0×10^{-3}
B. 3.2×10^{-3} D. 4.0×10^{-3}

10. A certain FM radio station operates at a frequency of 1.08 x 10^6 Hz. Calculate the wave length of the radio waves.

A. $3.60\ x\ 10^3\ m$ C. $2.78\ x\ 10^{-2}m$
B. $2.78\ x\ 10^2\ m$ D. $3.60\ x\ 10^{-2}m$

11. A S.4 student would like to measure the thickness of a barbed wire on a school fence.

The best instrument the student should use is;

A. A vernier caliper C. Tape measure
B. Micrometer screw gauge D. Metre rule

12.

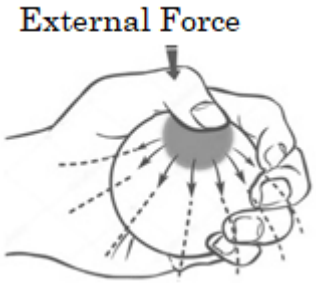


Figure 1

The diagram in the figure above shows the behavior of water in a balloon with identical holes. The conclusion that can be drawn from the observation is;

A. Pressure in fluids increases with depth
B. Pressure is maximum at mid height
C. Pressure reduces with depth
D. Pressure at a given depth acts equally in all directions

13. Water waves change direction when they move from shallow to deep water. What term describes this process?

A. Dispersion
B. Diffraction
C. Refraction
D. Reflection

14. Which colour are observed in regions A and B?

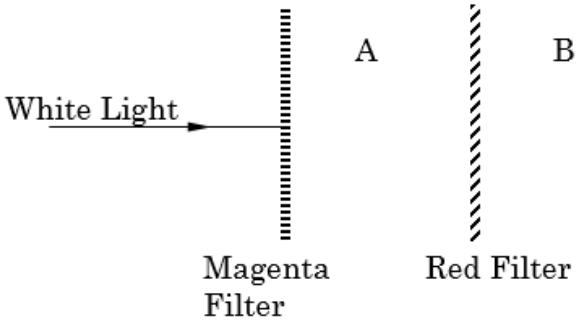


Figure 2

	Region A	**Region B**
A.	Red and Blue	Red
B.	White	Red
C.	Magenta	White
D.	Green and red	Yellow

15. The note from a plucked guitar will have a low pitch if the string is;

A. Thick and long
B. Thin and short
C. Thick and slack
D. Thin and long

16. Which of the following statements is true about the wave travelling from one medium to another?

i) Its frequency and wavelength change ii) Its velocity and wave length change iii) Its frequency and velocity change iv) Only its frequency remains unchanged

A. (i) only
B. (i) and (iii) only
C. (ii) and (iii) only
D. (ii) and (iv) only

17. The temperature at which all the heat energy is removed from a substance is called;

A. Kelvin temperature
B. Absolute zero temperature
C. Celsius temperature
D. Freezing temperature

18. Calculate the effective resistance for the arrangement in Fig.3

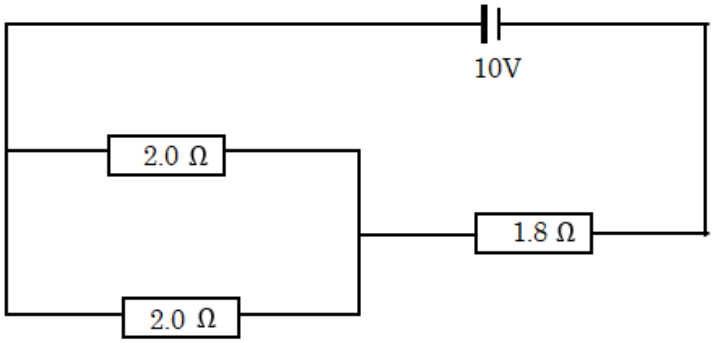


Figure 3

A. 0.7Ω
B. 3.0Ω
C. 2.8Ω
D. 6.8Ω

19. A body of mass 10kg moves with a uniform velocity of 5 ms^{-1}. Find its momentum in $kgms^{-1}$.

A. 2
B. 4
C. 50
D. 100

20. An image formed by a concave mirror coincides with its object placed 20cm away. Find the focal length of the mirror.

A. 5cm
C. 10cm
B. 20cm
D. 40cm

21. The figure below shows a sketch graph of acceleration against time for a body initially at rest.

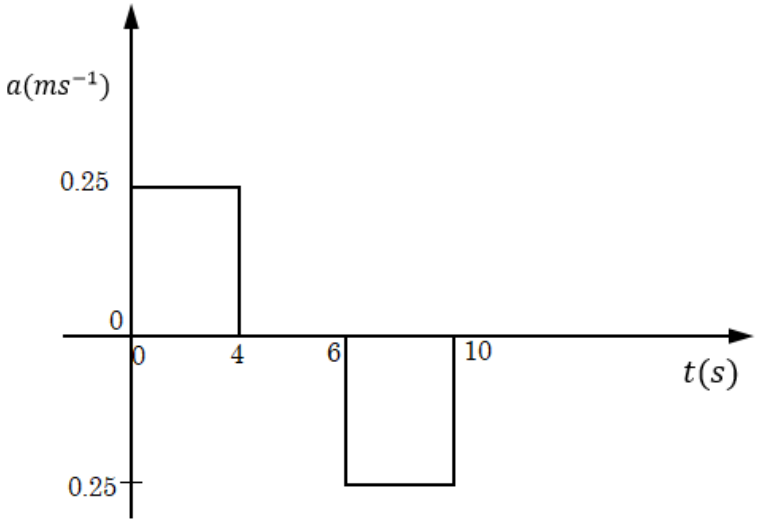


Figure 4

The velocity of the body in the first 4s is?

A. 0.25ms-1
C. 25ms-1
B. 1.0ms-1
D. 2.5ms-1

22. On a frosty day, the metal handle bars of a bicycle feel colder than the rubber grips because the;

A. Rubber is a better absorber of radiation than the metal
B. Metal is colder than the rubber
C. Rubber has higher heat capacity than the metal
D. D. Metal is a better conductor of heat than the rubber.

23. A water pump raises 200kg of water through a vertical height of 72m in one hour. Calculate the power of the pump.

A. 400,000W
C. 4,000W
B. 400W
D. 40W

24. Sea breeze occurs

A. When cool air blows towards the land

B. When warm air blows towards the land

C. During the night

D. When cool air blows towards the sea

25. Which of the following graph represents the variation of activity of a radioactive substance with time?

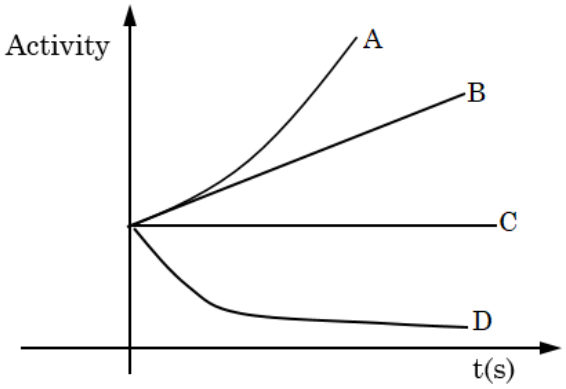
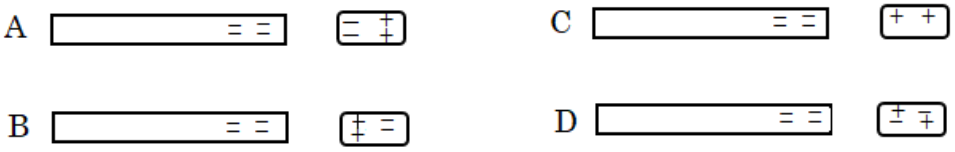


Figure 5

26. A negatively charged rod is brought close to an uncharged metal sphere which is held on an insulated stand. Which of the following diagrams shows the



distribution of charge on the sphere when the rod is near?

27. The characteristics of an image formed in a a plane mirror is?

A. Upright, real with magnification of 2

B. Upright, virtual with magnification of 1

C. Inverted, real with magnification of 2

D. Inverted, virtual with magnification of 1

28. In a simple cell, the convectional flow of current is; A. From the positive to the negative terminal of the cell

B. From the negative to the positive terminal

C. Due to polarization

D. Due to local action

29. A load of 40N is pulled steadily from A to B along an inclined plane by a force F is shown in figure 6. Find the velocity ratio of the system.

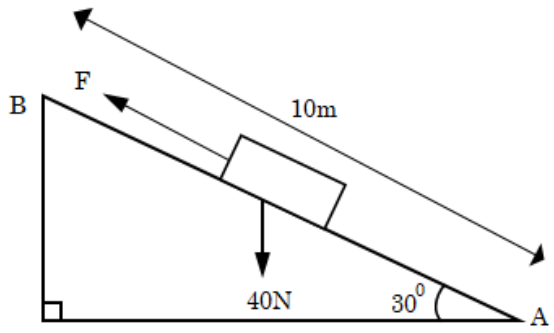
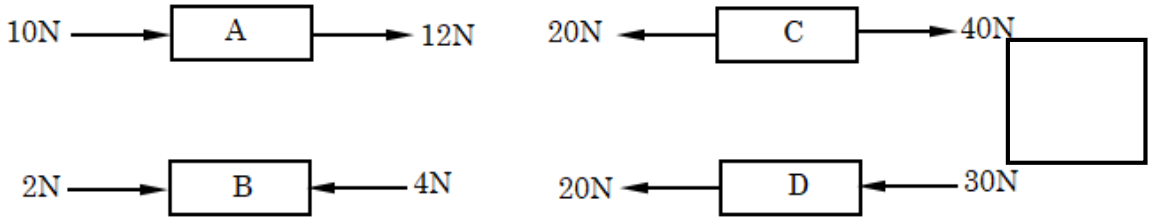


Figure 6

A. 0.866
B. 2.000
C. 0.500
D. 4.000

30. Which **one** of the following diagrams shows the arrangement of forces which gives the greatest acceleration of the block?



31. A body of mass 1500g is placed on a planet where the acceleration due to gravity is two – fifth that of the earth. Find the weight of the body on the planet.

A. $\frac{1500\ x\ 10}{5}$
B. $\frac{1500\ x\ 2\ x\ 10}{1000\ x\ 5}$
C. $\frac{1500\ x\ 5\ x\ 10}{100\ x\ 2}$
D. $\frac{1500\ x\ 2\ x\ 10}{5}$

32. White light is separated into its component colours by a prism due to;

A. Absorption
B. Reflection
C. Dispersion
D. Transmission

33. A load of 4N stretched a spring by 0.5cm. Calculate the extension when a load of 8N is applied.

A. 0.25cm
B. 2.0cm
C. 1.0cm
D. 4.0cm

34. A vibrator produces waves which travel a distance of 35cm in 2 s. If the distance between successive wave crests is 5cm, what is the frequency of vibrator?

A. 3.5Hz C. 7.0Hz B. 14.0Hz D. 87.5Hz.

35. When a ray of light incident on a plane mirror at an angle of incidence of 31^0 is reflected from the mirror, it subsequently strikes a second plane mirror placed so that the angle between the mirrors is 45^0. The angle of reflection at the second mirror is;

A. 620
B. 900
C. 140
D. 760

36. The pressure of the air inside a car tyre increases if the car stands for some time in full light. According to the kinetic theory, this is due to an increase inside the tyre of the;

A. Speed of the air molecules
B. Number of air molecules
C. Size of the molecules
D. Total mass of the air molecules

37. When the circuit in fig. 7 is switched on, the voltmeter

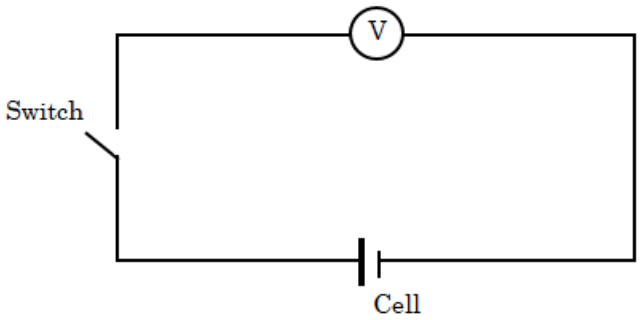


Figure 7

A. Shows no deflection
B. Deflects in a wrong direction
C. Reads the Emf of the cell
D. Reads of the internal resistance of the cell

38. A simple thermometer has a stem and a bulb containing a liquid. Which one of the following will help the thermometer to rapidly register a new temperature?

A. A larger bulb
B. A long stem
C. A thin walled bulb
D. A liquid of high density

39. Which of the following are applications of total internal reflection of light?

i) Optical fibres ii) Transmission of radio waves iii) Total reflecting prisms iv) Mirage

A. (i) only
B. (i), (ii) and (iv) only
C. (i) and (iii) only
D. (i), (ii) and (iii) only

40. The unit $1VA^{-1} = 1\Omega$ is the SI-Unit of;

A. Electric current
B. Resistance
C. Emf
D. Potential difference

SECTION B: (40 MARKS)

41. (a) Define the following terms as used in light;

(i) **Critical angle** (01 mark)

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(ii) **Total internal reflection**. (01 mark)

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(b) Total internal reflection is applicable in the transmission of radio waves. Briefly explain how radio waves are transmitted from the transmitter to the receiver. (02 marks)

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41. (a) State **two** factors on which pressure exerted by a liquid depends. (02 marks)

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(b) A block of mass 2kg measures 0.20m by 0.15m by 0.1m. Calculate the least pressure exerted by the block on the ground. (02 marks)

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43. (a) Define the term **terminal velocity**. (01 mark)

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(b) Explain why a parachutist usually travels at a constant velocity for the last part of his drop. (03 marks)

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44. (a) The following nuclear reaction takes place when a neutron bombards a Sulphur atom

$$^{34}_{16}S + ^{1}_{0}n \rightarrow ^{a}_{b}Y$$

(i) State the values of **a** and **b** (01mark)

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(ii) The nuclide Y decays by emission of alpha particle forming an atom Q. Write a balanced equation to show the changes in the mass number and atomic number of the nuclide. (01 mark)

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(b) **93.75** % of a radioactive Cobalt-60 decays in 4488 years. Determine the half life of Cobalt -60. (02 marks)

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45. (a) State the **law** of electrostatics. (01 mark)

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(b) A charge of 180C flows through a circuit for 2 minutes. Find the electric current flowing through the circuit. (03 marks)

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46. (a) What is meant by the term **antinode** as applied in waves**?** (01 mark)

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(b) State **two** factors that affect diffraction of sound waves (01 mark)

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(c) A sound wave of frequency 440Hz has a velocity of 330ms^{-1}. Calculate its wave length. (02 marks)

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47. (a) (i) State the principle moments. (01 mark)

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(ii) State any **two** applications of the principle of moments.

(01 mark)

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(b) A uniform metre rule is pivoted at the 40cm mark as shown in fig.8. The metre rule balances when a weight of 20N is placed at the 10cm mark.

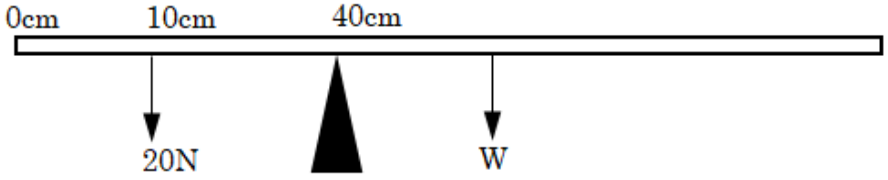

Figure 8

Calculate the weight of the metre rule W. (02 marks)

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48. (a) State the **two** defects of a simple cell and suggest a remedy to each. (02 marks)

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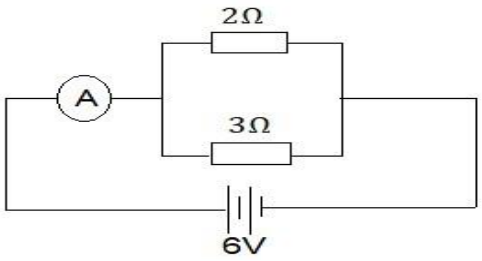
(b) Two resistors of 2Ω and 3Ω are connected with a cell of Emf 6V and negligible internal resistance as shown below



Determine the current flowing through the ammeter A. (02 marks)

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49. (a) Distinguish between **Renewable energy sources** and **non-renewable energy sources.** 02 marks)

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(b) A man lifts a bag of mass 60kg through 1.5m in 15s. Calculate the power expended. (02 marks)

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50. (a) Define **heat capacity**. (01 mark)

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(b) Calculate the quantity of heat required to raise the temperature of 5kg of iron by 65^{o}C given that the specific heat capacity iron is 460Jkg^{-1}K^{-1}.

(02 marks)

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(c) The specific heat capacity of water is 1000Jkg^{-1}K^{-1}. State the importance of this high value of specific heat capacity. (01 mark)

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END

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