Names:.....BALUKU MARTIN.....Signature .....

School Exam Number:.....Index No:.....

*Candidates should **NOT** write their Centre Name or Centre Number anywhere on this booklet*

535/1
PHYSICS
Paper 1
3 August 2023
2 ¼ hours

ENTEBBE JOINT EXAMINATION BUREAU

Uganda Certificate of Education

PHYSICS

Paper 1

2 hours 15 minutes

INSTRUCTIONS TO CANDIDATES

Section **A** *contains 40 objective – type questions. You are required to write the correct answer **A, B, C** or **D** in the answer grid provided on page **Nine**.*

Section **B** *contains 10 structured questions. Answers must be written in the spaces provided on the question paper.*

Answers to Section **B** *must be filled in the spaces provided on the question paper.*

Mathematical tables, slide rules and silent non – programmable calculators may be used.

Acceleration due to gravity g, $= 10ms^{-2}$
Specific heat capacity for water $= 4.2x103Jkgk^{-1}$
Specific latent heat of fusion of ice $= 3.36x105Jkg^{-1}$
Specific latent heat of vapourisation of water $= 2.26x106Jkg^{-1}$

		FOR OFFICIAL USE ONLY										
QN	SEC A	41	42	43	44	45	46	47	48	49	50	TOTAL
MCQ												

SECTION A (40 MARKS)

1. An alternative unit that could be used for voltage is

A. joule per second.
B. joule per coulomb.
C. coulomb per second.
D. volt per metre.

2. A condenser lens in a slide projector is used to

A. give an even illumination of the screen.
B. protect the slide from the heat of the lamp.
C. give an even illumination of the slide.
D. form a sharp image on the screen.

3. In order to make mercury-in-glass thermometers more sensitive

A. degree markings must be further apart.
B. diameter of the capillary tube must be reduced.
C. the capillary tube must be open to air.
D. the stem of the thermometer must be thick.

4. Light coloured clothes are more comfortable to wear on a hot day than dark ones because

(i) light-coloured clothes are better reflectors of radiation.
(ii) light coloured clothes are better absorbers of radiation.
(iii) dark coloured clothes are less attractive.

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

5. In a hydraulic press, the area of the piston on which the effort is applied is made smaller in order to

A. transmit a force as large as possible to the load.
B. obtain a pressure as large as possible.
C. facilitate the movement of the piston downwards.
D. transmit pressure equally throughout the liquid.

6. A small amount of a radioactive isotope contains 7.2×10^{10} unstable nuclei. The half-life of the isotope is 4 hours. How many unstable nuclei would remain after 12 hours?

A. 6.0×10^{9}
B. 9×10^{9}
C. 1.8×10^{10}
D. 1.9×10^{10}

7. A circular dipper is made to touch the water surface in a basin at a constant rate. In 2 seconds, three wave crests are produced on the surface of the water as shown in figure 1.

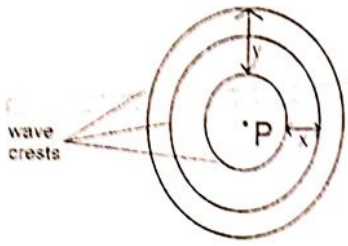


Fig 1

Which of the following statements is true?

A. Distance X is the amplitude of the waves.
B. Distance Y is the wave length of the waves.
C. Each circle represents a wave front.
D. The frequency of the waves is 3Hz.

8. A transformer has 200 turns in the primary coil. Calculate the number of turns in the secondary coil if $240V$ is stepped up to $414V$ by this transformer.

A. 116
B. 654
C. 440
D. 345

9. A body moving in with a velocity of $20ms^{-1}$ accelerates to a velocity of $40ms^{-1}$ in 5€al culate the distance travelled in this time interval.

A. $150\ m$
B. $4\ m$
C. $100\ m$
D. $200\ m$

10. A man of mass $60kg$ climbs a stair case. If each stair is of height $30cm$ and he takes $9s$ developing a power of $500W$ in the process, calculate the number of stairs in the case.

A. 250
B. 25
C. 0.25
D. 2.5

11. A cuboid of wood of mass $20g$ measures $5cm$ by $4cm$ by $2cm$. Find its density in kgm^{-3}.

A. 2
B. 0.5
C. 500
D. 250

12. Although the mechanical advantage of a single pulley is less than 1, it is commonly used at construction sites because

A. effort is less than the load overcome.
B. it is convenient to apply the effort downwards in the direction of the gravitational pull.
C. It is cheaper .
D. only one pulley is used.

13. A uniform wooden plank balances horizontally when a mass of $1.8kg$ is hung at one of its ends as shown below.

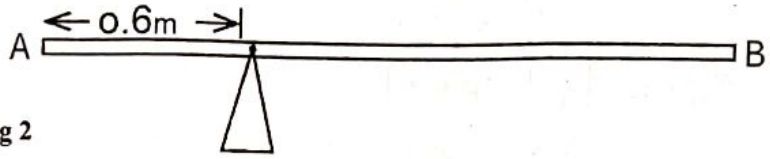


Fig 2

If its weight is $8N$, find its length.

A. $2.70m$
B. $1.95m$
C. $1.35m$
D. $3.90m$

14. A lamp is marked $12V, 24W$. Calculate the amount of electrical energy it consumes in 15 minutes.

A. $360J$
B. $2J$
C. $288J$
D. $21600J$

15. The property of x-rays which makes them possible to detect cracks in bones is that they

A. can be reflected.
B. have long wave length.
C. are invisible.
D. have a high penetrating power.

16. $75cm^3$ in cubic metres is

A. 7.5×10^{-5}
B. 7.5×10^{-3}
C. 7.5×10^{-1}
D. 7.5×10^{3}

17. A metal cylinder contains a liquid of density $1100kgm^{-3}$. The area of the base of the cylinder is $0.005m^2$ and the height of the liquid is $5m$. Calculate the force exerted on the base of the cylinder.

A. $55N$
B. $275N$
C. $5.5N$
D. $5500N$

18. A body P of mass $100g$ collides with a stationary body Q of mass $200g$. After collision, P moves backwards with a velocity of $2ms^{-1}$ while Q moves forward with a velocity of $5ms^{-1}$. Calculate the velocity of P before the collision.

A. $5ms^{-1}$
B. $12ms^{-1}$
C. $8ms^{-1}$
D. $14ms^{-1}$

19. A stationary wave is a wave where

A. there is continuous energy transfer.
B. there is no energy transfer.
C. there is a single wave moving.
D. compressions and rare factions are formed.

20. When the bulb of a mercury-in glass thermometer is placed in contact with ice cubes from a refrigerator, the mercury level is seen to drop to a point $1.8cm$ below the lower fixed point of the thermometer. If the fundamental internal of the thermometer is $12cm$, find the temperature of the ice cubes.

A. $7.5°C$
B. $-7.5°C$
C. $92.5°C$
D. $24°C$

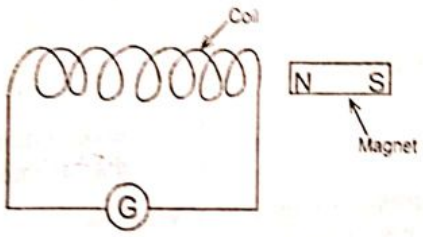
21. Which of the following statements is /are true?

(i) green light shone on a green surface is all absorbed.
(ii) green light added equally to red light appears yellow.
(iii) green light passes through a red filter.

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

22. The arrangement in figure 3 shows a coil connected to a centre-zero galvanometer. When the magnet is plunged into the coil the galvanometer deflects showing that an e.m.f is generated in the coil.

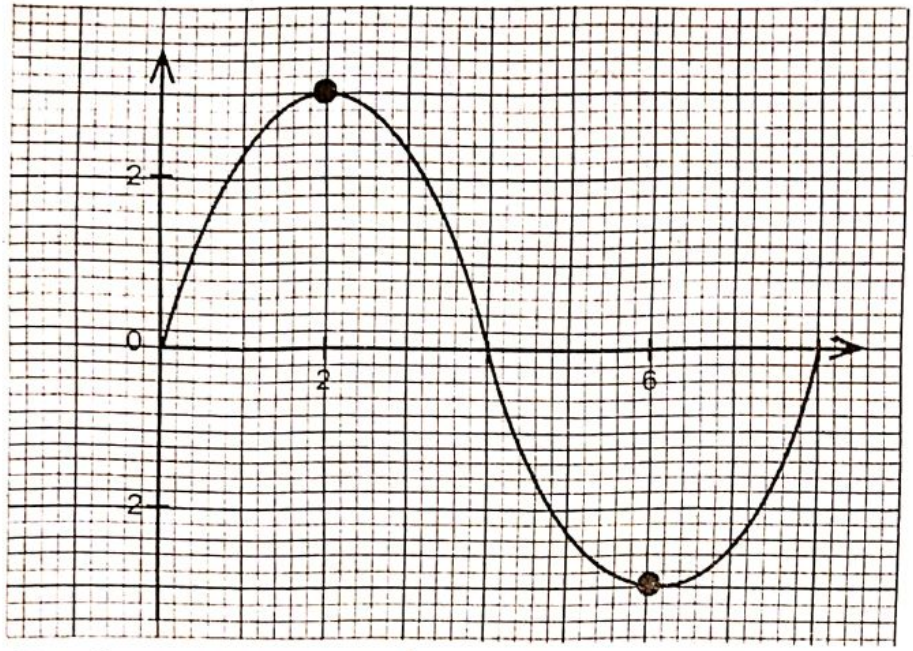
Fig 3



What is the likely cause of the e.m.f? The

A. attraction between the coil and the magnet.
B. magnet placed close to the coil.
C. Magnet's field outside the coil.
D. variation of magnetic field lines linking the coil.

23. The graph below shows a wave form displaced on the screen of a cathode ray oscilloscope (C.R.O) when an a.c. voltage is connected across the y-plates.



If the voltage gain is set at $4Vcm^{-1}$, what is the peak-to-peak voltage?

A. $8V$
B. $16V$
C. $32V$
D. $64V$

24. The air pressure at the bottom of a mountain is $75cmHg$ and $60cmHg$ at the top. If the average density of air is $1.25kgm^{-3}$ and the density of mercury is $13600kgm^{-3}$, calculate the height of the mountain.

A. $1540m$
B. $1632m$
C. $845m$
D. $13540m$

25. The rate at which distance covered by a body changes into time is known as

A. speed
B. velocity
C. acceleration
D. displacement

26. The distance between 21 successive crests of a water wave of speed $17ms^{-1}$ is $85cm$. Calculate the frequency of the wave.

A. $4.2Hz$
B. $420Hz$
C. $400Hz$
D. $20Hz$

27. Which of the following energy conversions is correct for the given device?

A. Motor: mechanical $\longrightarrow$ electrical
B. Generator: electrical $\longrightarrow$ light
C. Microphone: electrical $\longrightarrow$ sound
D. Loud speaker: electrical $\longrightarrow$ sound.

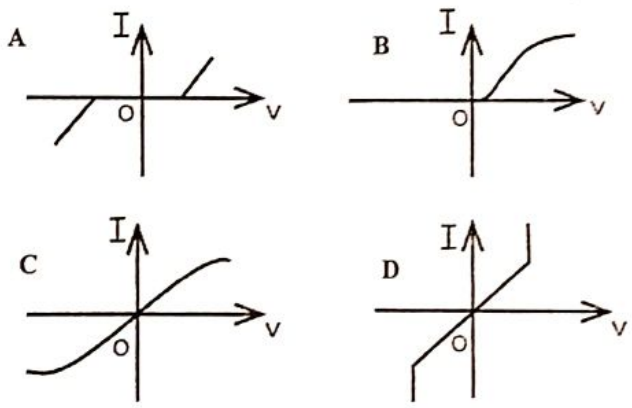
28. It is easier to use a claw hammer to remove a nail from a piece of wood if the handle is longer because the

A. effort applied becomes bigger.
B. turning effect becomes bigger.
C. anticlockwise moment will balance with clockwise moment.
D. fulcrum is between the effort and the load.

29. A wheel and axle system is used to lift a log of mass $90kg$ using an effort of $300N$. If the wheel and axle radii are $40cm$ and $10cm$ respectively, calculate the efficiency of the system.

A. 50%
B. 75%
C. 80%
D. 72.5%

30. Which of the following graphs shows the variation of current with voltage for a filament lamp?



31. A floating body sinks deeper in water than in liquid L. It can be deduced that the;

(i) density of L is greater than that of water.
(ii) density of L is less than that of water.
(iii) hydrometer displaces a greater mass of water than that of L.

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

32. Fig 4

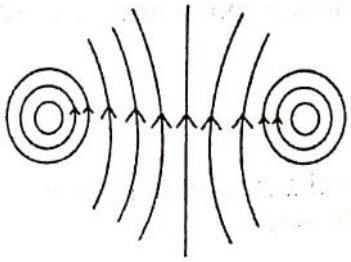


Figure 4 represents a magnetic field pattern caused by a

A. long solenoid carrying a current.
B. circular coil carrying a current.
C. straight long wire carrying a current.
D. bar magnet.

33. Which of the following particles is most suitable for bombarding uranium to cause nuclear fission?

A. proton
B. electron
C. neutron
D. alpha

34. The frequency of the third harmonic in an open pipe is $500Hz$. Find the length of the air column producing this harmonic.

A. $1.56m$
B. $0.64m$
C. $1.00m$
D. $0.99m$

35. A parachutist from an aircraft will fall with constant velocity when;

A. his weight is equal to up-thrust.
B. his weight is equal to air resistance.
C. air resistance is equal to up-thrust .
D. up-thrust on him plus air resistance are equal to his weight.

36. A bullet is fired vertically upwards from the ground. If it reaches its maximum height in $4s$, find the total distance it covers by the time it hits the ground.

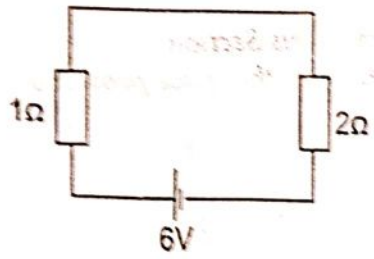
A. 40m
B. 80m
C. 160m
D. 280m

37. The critical angle for light travelling from glass to water is x. If the refractive indices of water and glass are 1.33 and 1.50, the value of x in degrees is;

A. 62.5
B. 48.8
C. 41.8
D. 90

38. A battery of *emf* 6*V* and negligible internal resistance is connected in series with two resistors of 2Ω and 1Ω as shown in figure 5

Fig 5



Calculate the p.d. across the 2Ω resistor.

A. 2*V*
B. 2.5*V*
C. 3*V*
D. 4*V*

39. A wire is fastened between two supports and plucked to make a note. A note of higher pitch can be made by

A. raising the temperature.
B. using a shorter wire.
C. using a thicker wire.
D. loosening the wire.

40. In household wiring, all the circuits are connected in parallel with the power supply in order to;

A. operate at the same potential difference.
B. share current equally.
C. share the potential difference.
D. avoid short circuits.

	ANSWER GRID FOR SECTION A								
1 D	2 D	3 C	4 A	5 C	6 C	7 A	8 B	9 B	10 C
11 C	12 A	13 C	14 A	15 A	16 D	17 D	18 C	19 D	20 D
21 D	22 A	23 B	24 D	25 D	26 C	27 C	28 D	29 A	30 A
31 D	32 D	33 D	34 A	35 B	36 C	37 A	38 C	39 B	40 D

SECTION B (40 marks)

Answer all questions in this Section.
All working must be shown clearly in the space provided.

41. (a) (i) Define the term **coulomb**. *(01 mark)*

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(ii) A charge of $40C$ flows through an ammeter in $20s$. What is the reading of the ammeter? *(02 marks)*

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(b) State **two** factors which the resistance of a copper wire fixed between two points $80cm$ can be reduced. *(01 mark)*

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42. (a) (i) What is meant by the term **long-sightedness**? *(01 mark)*

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(ii) How can long-sightedness be corrected? *(01 mark)*

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(b) Calculate the power of a converging lens whose focal length is $20cm$. *(02 marks)*

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43. (a)

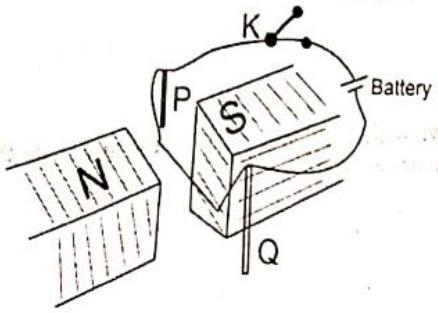

Fig 6

A straight conductor is hung between two ends of bar magnets using supports *P* and *Q*. The fine wires supporting the conductor are connected to a d.c. source as shown. When switch *K* is closed, the wire is seen to move upwards slightly.

(i) Briefly explain this observation. *(02 marks)*

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(ii) State **two** waves in which this effect can be increased. *(01 mark)*

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(b) What is meant by the term **magnetic saturation**? *(01 mark)*

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44. (a) Name any **two** particles in an atom. *(01 mark)*

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(b) Why is an atom electrically neutral? *(02 marks)*

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(c) Given elements $^{222}_{88}Ra$; how many charged particles are there in one atom of this element? *(01 mark)*

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45. (a) Define the term **Pascal**. *(01 mark)*

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(b) Explain why the walls of a water reservoir are made thicker and stronger at the bottom than at the top? *(02 marks)*

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(c) Explain why tractors rarely get stuck when moving on a muddy road. *(01 mark)*

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46. (a) State **the law of floatation**. *(01 mark)*

It states that a body displaces its own weight of fluid in which it floats.

(b) A cube of wood of volume $0.2m^3$ and density $600kgm^{-3}$ is placed in a liquid of density $800kgm^{-3}$. What force must be applied to the cube so that the top surface of the cube is at the same level with the liquid surface? *(03 marks)*

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47. (a) Define **diffraction** as applied to waves. *(01 mark)*

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(b) Draw a sketch diagram to show how straight wave fronts appear after passing through a barrier with a slit whose width is smaller than the wavelength of the incident waves. *(02 marks)*

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(c) Explain briefly why echoes are not heard in small rooms? *(01 mark)*

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48. (a) State **the principle of conservation of energy**. *(01 mark)*

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(b) With reference to a four-stroke engine, state the use of;

(i) a spark plug *(½ mark)*

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(ii) an outlet valve *(½ mark)*

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(c) State the energy changes that occur in a four-stoke petrol engine. *(02 marks)*

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49. (a) State the conditions for a rigid body under action of force to be in equilibrium. *(02 marks)*

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(b) State **four** instances where forces that constitute a couple are put into practice. *(02 marks)*

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50. Figure 7 shows a hydraulic press with a pump piston of area $1.2 \times 10^{-3} m^2$.

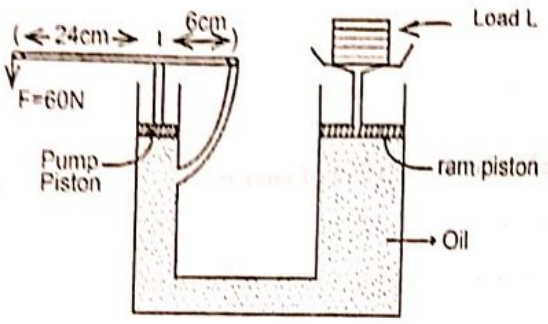

Fig 7

An effort of $60N$ is just enough to lift lied L.

(i) Find the value of L. *(03 marks)*

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(ii) Velocity ratio of the system. *(01 mark)*

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END