

Name: Centre/Index No:.....
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535/1
PHYSICS
Paper 1
July / Aug. 2023
2 hours 15 minutes



UGANDA TEACHERS' EDUCATION CONSULT (UTEC)

Uganda Certificate of Education

PHYSICS

Paper 1

2 hours 15 minutes

INSTRUCTIONS TO CANDIDATES:

Attempt **all** questions in this paper.

Where necessary assume:

<i>Acceleration due to gravity</i>	$= 10\text{ms}^{-1}$
<i>Specific heat capacity of water</i>	$= 4200\text{Jkg}^{-1}\text{K}^{-1}$
<i>Specific latent heat of fusion of water</i>	$= 340,000\text{Jkg}^{-1}$
<i>Velocity of electromagnetic waves</i>	$= 3.0 \times 10^8\text{ms}^{-1}$
<i>Velocity of sound waves</i>	$= 330\text{ms}^{-1}$
<i>Density of water</i>	$= 1000\text{kgm}^{-3}$
<i>Density of mercury</i>	$= 13600\text{kgm}^{-3}$
<i>Specific heat capacity of ice</i>	$= 2100\text{Jkg}^{-1}\text{K}^{-1}$

SECTION A (40 Marks)

1. Which of the following is true about specific gravity?
A. It is measured in kilograms per cubic meter
B. It has no units
C. It compares densities of liquids to that of water only.
D. It relates densities of solids to water only. ☐
2. The major difference between soft and hard X-rays is?
A. Velocity
B. Intensity
C. Frequency
D. Polarization ☐
3. Why is iron considered a suitable material for the construction of the core of a transformer?
A. It is a metal.
B. It does not readily get hot.
C. It is easily magnetized.
D. It is an electrical conductor. ☐
4. For a given sound system, the minimum frequency of a standing wave is in a
A. Fundamental mode
B. Lowest mode
C. Highest mode
D. Peak mode ☐
5. The p.d of a battery is 2.2 V . When connected across a 5Ω resistor, suddenly this p.d falls to 1.8 V , calculate its internal resistance.
A. 1.0Ω
B. 1.1Ω
C. 2.0Ω
D. 2.1Ω ☐
6. Which one of the following sources of energy are renewable energy?
A. Solar, Biogas and Tidal.
B. Fossil, Nuclear and Tidal.
C. Solar, Nuclear and Biogas.
D. Solar, Tidal and Fossil. ☐

7. Bimetallic strips are applied in
- A. Vapor-pressure thermometers
 - B. Liquid expansion thermometers
 - C. Metal expansion thermometers
 - D. Resistance thermometers
8. The following affect the magnitude of surface tension except?
- A. Temperature
 - B. Dirt
 - C. Soap
 - D. Surface area
9. A radioactive source has a half-life of 80s. How long will it take for $\frac{7}{8}$ of the source to decay?
- A. 10s
 - B. 70s
 - C. 240s
 - D. 640s
10. The working of bow and the arrow applies all the following except?
- A. Hooke's law
 - B. gravitational law
 - C. Newton's first law
 - D. Conservation of energy law
11. When a vibrating object moves backwards, it creates a region of low pressure called?
- A. Refraction
 - B. Reflection
 - C. Rarefaction
 - D. Retardation
12. A positively charged rod was moved near the cap of a negatively charged gold leaf electroscope, the effect observed in the divergence of the gold leaf is?
- A. Decrease
 - B. Increase
 - C. no effect
 - D. increase then collapse

13. The seven coloured lights of the spectrum can be recombined when the two prisms are placed in
- A. Horizontal position with respect to each other
 - B. Adjacent position with respect to each other.
 - C. Inverted position with respect to each other.
 - D. Vertical position with respect to each other.
14. Why are petrol tanks painted silvery bright?
- A. To absorb heat.
 - B. To reflect away heat
 - C. To prevent heat loss
 - D. To prevent evaporation of oil since its volatile
15. The dynamo on a bicycle converts
- A. Mechanical energy to light.
 - B. Electrical energy to light.
 - C. Mechanical energy to electrical.
 - D. Heat from friction to light
16. The length of an open pipe which produces a third harmonic of frequency 600Hz is?
- A. 0.23m
 - B. 0.83m
 - C. 1.10m
 - D. 1.50m
17. A lead acid cell must be charged regularly to;
- A. prevent charge leakage
 - B. avoiding topping up
 - C. avoid drying up
 - D. avoid sulphation
18. The half-life of radon gas is 4 days. If some radon gas is accidentally released into a closed laboratory, how long would it take for the concentration of the gas to fall below 1% (one percent) of its original value?
- A. 4 days
 - B. 12 days
 - C. 28 days
 - D. 56 days

19. The flow of the fluid is said to be streamline if
- A. there is an obstacle in the fluid.
 - B. the shape of the tube changes abruptly in diameter or direction.
 - C. The speed of the fluid becomes too great.
 - D. The pattern of the fluid flow does not change over
20. The effect of excessive frost collection inside a deep freezer is?
- A. Lowers the freezer temperature
 - B. Acts as an insulator and slows cooling.
 - C. Keeps the food content fresh
 - D. Liquidates the refrigerant
21. At one end of a ripple tank 180cm across, a 12Hz vibrator produces waves whose wavelength is 60mm. The time needed to cross the wave is?
- A. 0.25 s
 - B. 2.5s
 - C. 7.2s
 - D. 720s
22. Lenz's law is applied in the iron ring experiment in order to predict the direction of
- A. Force in the secondary coil
 - B. Force in the primary coil
 - C. Induced current in the secondary coil
 - D. Induced e.m.f in the primary coil
23. Which of the following is **NOT** true about Ultraviolet radiations?
- A. Emitted from fairly high energy changes in electron structure of atoms
 - B. Originates from hot radioactive bodies
 - C. Originates from electric discharge through gases, particularly mercury vapor in quartz envelopes.
 - D. Emitted from high frequency oscillatory electric currents.
24. Objects viewed through a blue-tinted glass appear blue because the;
- A. glass reflects only blue.
 - B. objects reflect the blue colour.
 - C. glass transmits only blue
 - D. glass is transparent

25. In an experiment to determine the focal length of a converging lens while using an illuminated object and a plane mirror, the illuminated object is put at the
- A. Focal point of the lens
 - B. Centre of curvature of the lens
 - C. Principle axis of the lens
 - D. Centre of the plane mirror and the lens
26. Shoulder bags and bag packs have wide padded straps so that the weight of the bag fall over
- A. a large area to maximize pressure
 - B. a small area to maximize pressure
 - C. a large area to minimize the pressure
 - D. a small area to minimize the pressure
27. Which of the following applications of Hooke's law illustrates deformation as a depression of the free end?
- A. Loading a wire
 - B. Loading a spiral spring
 - C. Loading a horizontal beam fixed at one end
 - D. Tightening a watch spring
28. During an atomic explosion, the energy released is due to conversion of
- A. protons to neutrons
 - B. chemical energy into heat energy
 - C. mechanical energy into nuclear energy
 - D. mass into energy
29. Which one of the following devices uses flow of current through a conductor in a magnetic field to produce motion?
- A. Microphone.
 - B. Loud speaker.
 - C. D.C generator.
 - D. Alternator.
30. Whenever the surfaces in contact tend to move or move with respect to each other, the force of friction comes into play.
- A. Only if the objects are solid
 - B. Only if one of the two objects is liquid
 - C. Only if one of the two objects is gaseous
 - D. Irrespective of whether the objects are solid, liquid or gaseous.

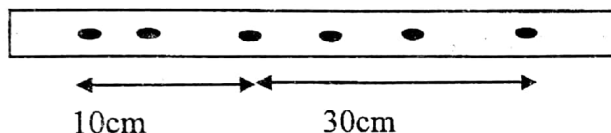
31. The lightning conductor operates on the principle of
- the law of electrostatics
 - local action
 - action at a point
 - neutral point



32. Which of the following are properties of images formed in a plane mirror
- Same size as the object
 - Laterally inverted
 - Virtual
 - Real
- i, ii and iv only
 - i, ii, and iii only
 - i, iii, and iv only
 - i, ii, iii and iv



33. Figure 1.



The diagram in figure 1 above shows dots printed by a ticker timer of frequency 100Hz. calculate the acceleration of the locomotive

- 50 ms^{-2}
- 100 ms^{-2}
- 150 ms^{-2}
- 200 ms^{-2}



34. Which of the following occurs during 'induction' in a four -stroke cycle in a diesel engine?
- The piston admits air only into the cylinder
 - The air is compressed to its minimum volume
 - Fuel is pumped into the cylinder
 - Both valves close and the piston moves up.

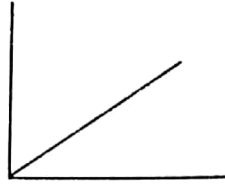


35. Notches and cracks spread more rapidly when brittle materials are under
- Strain
 - Tension
 - Compression
 - Extension

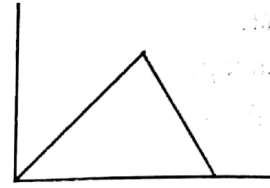


36. Which of the following velocity-time graphs represents the motion of a body thrown vertically upwards?

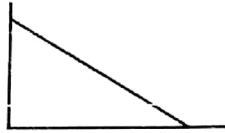
A.



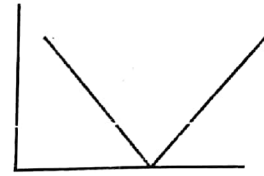
C.



B.



D.



37. A uniform meter rule is provided at the 20cm mark and balanced by a mass of 300g put at the 10cm mark, the mass of the meter rule is?

- A. 1g
- B. 50g
- C. 100g
- D. 600g



38. Which of the following are the effects of force on a body?

- (i) Stops motion
- (ii) Changes mass
- (iii) Changes shape
- (iv) Changes direction

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



39. In a hydraulic car brake, the area of the piston on which the effort is applied is made smaller in order to

- A. Facilitate the movement of the piston downwards.
- B. Overcome a force as large as possible of the load.
- C. Transmit pressure equally through
- D. Obtain a pressure as large as possible



40. The device which melts to break the circuit when too much current flow is called

- A. a socket
- B. a socket breaker
- C. a fuse
- D. earth wire



SECTION B (40 marks)

41. a) A gas jar full of air is inverted over another jar full of brown nitrogen dioxide gas (*nitrogen dioxide gas is lesser than air*)

i) State what is observed if the setup is left to stand for some time? (01 mark)

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ii) What conclusion can be drawn from the observation in a(i)? (01 mark)

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- b) A small amount of water placed on wax forms small droplets but spreads out when placed on glass. Explain. (02 marks)

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42. a) Define the term '**lateral inversion**' as used in reflection of light. (01 mark)

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- b) Explain, with the aid of a ray diagram how the eye sees the image of a bright point formed by a plane mirror. (02 marks)

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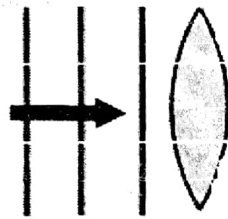
- c) State the effect of doubling the distance between pinhole and screen on the image formed in a pin-hole camera. (01 mark)

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43. a) Define **diffraction** as applied to wave properties. (01 mark)

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- b) Fig.2 below shows plane waves approaching a convex lens.



- i) Sketch the pattern to show how the wave is refracted. (1½ mark)
ii) How can refraction of such waves be illustrated in a ripple tank? (1½ mark)

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44. a) i) Give any **two** properties of electric field line. (1mark)

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- (ii) Fig 3.



The diagram in figure 3 above shows a positively charged spherical conductor near an earthed metal plate. Sketch the electric field between them.

(01 mark)

- b) Draw a well labeled diagram of a gold leaf electroscope.

(02 marks)

45. a) What is meant by the **electromotive force** of a cell?

(01 mark)

- b) Two cells each of e.m.f 1.5V and internal resistance of 2ohms are connected in parallel across a 1ohm resistor.

- i) Sketch the circuit showing the arrangement.

(01 mark)

- ii) Calculate the current through the circuit

(02 marks)

46. a) State **Archimedes' principle**.

(01 marks)

- b) A ship of mass $1.3 \times 10^6 \text{ kg}$ floats in sea water. If the ship enters fresh water, what mass of cargo must be unloaded so that the same volume of water is displaced as before? (Take: Density of fresh water = 1000 kg m^{-3} , Relative density of sea water 1.03). (02 marks)

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- c) Explain why a cork released below the surface of water rises. (01 mark)

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47. a) Define the term 'couple' as used in forces. (01 mark)

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- b) A uniform rod of mass 5 kg and length 1.6 m is placed horizontally across smooth supports X and Y . If X is 10 cm from one end and Y is 50 cm from the other end. Find the reactions at X and Y . (02 marks)

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- c) State the two conditions for a mechanical system to be in equilibrium. (01 mark)

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48. a) Define the term '**neutral point**' as used in magnetism. (01 mark)

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b) Using the domain theory, explain demagnetization. (02marks)

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c) Draw the resultant field lines of a bar magnet placed in the earth's magnetic field with north pointing in the earth's magnetic field. (01 mark)

49. a) State the law of conservation of linear momentum. (01 mark)

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b) Explain why the recoil velocity is much less than the forward velocity of the bullet. (01 mark)

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c) An inflated balloon contains 2.0g of air which is allowed to escape from a nozzle at a speed of 4.0ms^{-1} . Assuming that the balloon deflates at a steady rate in 2.5s, what is the force exerted on the balloon? (02 marks)

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50. a) Briefly explain the differences between mass and weight. (02 marks)

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b) (i) Find the weight of an object whose mass is 20g. (01 marks)

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(ii) Why is an astronaut often weightless when in an Earth-orbiting spacecraft? (01 mark)

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END