

BUDAKA PROGRESSIVE HIGH SCHOOL

END OF TERM II EXAMS 2019

S.3 Physics Paper 1

Time: 2 hours 15 minutes

Instructions

- ❖ Attempt **all** questions in this paper.
- ❖ Section A has forty objective type questions. Write the correct alternative answer A, B, C or D in the table provided.
- ❖ Section B has ten structured questions. Write the answers in the spaces provided.
- ❖ Assume where necessary;
Acceleration due to gravity, g , = 10ms^{-2}
Density of water = 1000kg^{-3}

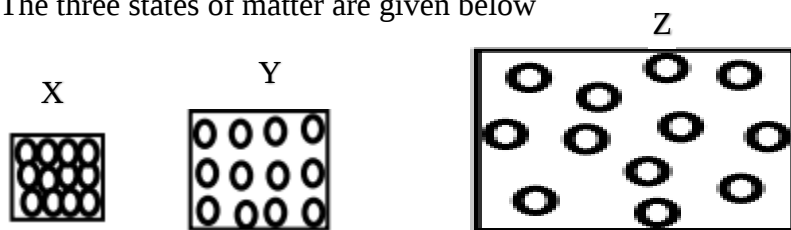
SECTION A: (40 MARKS)

Answers to questions in this section are to be written in the table below

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

1. Which of the following is best suitable for measuring the diameter of a wire accurately?
 - A. Metre rule
 - B. Vernier calipers
 - C. Micrometer screw gauge
 - D. Tape measure
2. Which one of the following sets consists of only vector quantities?
 - A. Momentum, acceleration, mass, time
 - B. Force, momentum, acceleration, current
 - C. Temperature, force, mass, time
 - D. Force, velocity, momentum, acceleration
3. The process by which electrons are emitted from a heated metal surface is called
 - A. Photoelectric emission
 - B. Radioactivity
 - C. Thermionic emission
 - D. Rectification
4. Which one of the following factors affects pressure in liquids?
 - A. Depth
 - B. Base area of the container
 - C. Weight of the container
 - D. Shape of the container
5. An isotope of a nuclide ${}^{35}_{17}\text{X}$ has
 - A. 18 protons and 17 neutrons
 - B. 17 electrons and 18 neutrons
 - C. 17 protons and 20 neutrons
 - D. 18 protons and 18 neutrons
6. The slope of a velocity -time graph is the
 - A. Speed of the body
 - B. Velocity of the body
 - C. Acceleration of the body
 - D. Distance travelled by the body
7. A ray of light travelling from a less dense to a denser medium is
 - A. Refracted towards the normal
 - B. Reflected away from the normal
 - C. Always reflected back to the same medium
 - D. Always transmitted without being reflected
8. A car accelerates from 4.0ms^{-1} to 20.0ms^{-1} in 8.0s . How far does it travel in this time?
 - A. 32m
 - B. 96m
 - C. 128m
 - D. 160m
9. A mass of 500 g produces an extension of 10 cm in a spring. Find the force that will produce an extension of 25cm.
 - A. 0.5N
 - B. 12.5N
 - C. 50.0N
 - D. 200.0N
10. The image formed in a plane mirror is
 - (i) The same distance behind as the object is in front
 - (ii) Laterally inverted
 - (iii) Magnified and virtual
 - A. (i) and (ii) only
 - B. (i) and (iii) only
 - C. (ii) and (iii) only
 - D. (i), (ii) and (iii)

11. The three states of matter are given below



Which of the following is correct?

	X	Y	Z
A	Gas	Solid	liquid
B	Liquid	Gas	Solid
C	Gas	Liquid	Solid
D	Solid	Liquid	Gas

12. Light travelling in air is incident on a medium at an angle of 60° . Find the refractive index, if the angle of refraction is 30° .

- A. 0.50 B. 0.58 **C. 1.73** D. 2.00

13. The principle of conservation of energy states that

- A. Energy is the ability to do work
 B. Energy is composed of kinetic and potential energy
 C. Energy will always be converted from one form to another
D. Energy cannot be created or destroyed but it can be changed from one form into another.

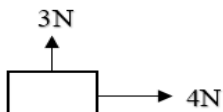
14. Cathode rays are

- A. Electromagnetic waves. C. Protons emitted by a hot cathode
 B. Stream of x-rays **D. Streams of electrons moving at high speed**

15. A current of 6A flows for 2 hours in a circuit. Calculate the quantity of electricity that flows in this time.

- A. 3 C B. 12 C C. 720 C **D. 43200 C**

16. Two forces of 3N and 4N act on a block as shown below.



Find the resultant force on the block.

- A. 2 N **B. 5 N** C. 1 N D. 7 N

17. A car of mass 5 kg accelerates steadily from rest to 40 ms^{-1} in 10 s. Calculate the force that produces this acceleration.
- A. 20.0 N B. 5.0N C. 2.0 N D. 125 N
18. Which one of the following is a primary cell?
- A. Lead acid accumulator C. Nickel iron cell
B. Dry cell D. Nickel cadmium cell
19. Find the force that would give a mass of 400g an acceleration of 8ms^{-2}
- A. 0.05N B. 3.20N C. 20.00N D. 50.00N
20. In an elastic collision,
- A. Bodies move with a common velocity C. Kinetic energy is conserved
B. Kinetic energy is not conserved D. Bodies stick together
21. The law of electrostatics states that
- A. Charges occur in pairs C. Like charges attract each other
B. Charges repel each other D. Like charges repel each other
22. Which of the following are second class levers?
- A. See saw, wheel barrow C. Pair of tongs, nut cracker
B. Wheel barrow, pair of tongs D. Wheel barrow, nut cracker
23. The product of mass and velocity of a body is called
- A. Momentum C. Inertia
B. Acceleration D. Moment
24. A body of mass 2kg is projected vertically upwards with a velocity of 10ms^{-1} . Find the maximum height reached.
- A. 0.5 m. B. 5.0m. C. 10.0m D. 50.0m
25. A needle floats on the surface of water because of
- A. adhesion C. surface tension
B. viscosity D. capillary attraction
26. When does the eclipse of the moon occur?
- A. When the moon is between the sun and earth.
B. When the earth is between the sun and the moon.
C. When the sun is totally eclipsed by the moon.
D. When a bright ring of sun light shows round the age of the moon. A mirage is formed as a result of
27. A hydraulic brake works on a principle of
- A. Transmission of pressure in a liquid B. High density

- C. Existence of viscosity
28. Which of the following are brittle substances?
- A. Dry clay, Steel, chalk and wood
- B. Chalk, steel, plastic, and glass
29. A ball of mass 1kg bounces off through a height of 2m. Find its potential energy
- A. 5J
- B. 20J**
- C. 30J
- D. 50J
30. Mass, length, and time are,
- A. Fundamental quantities**
- B. Units of measurement
- C. Derived quantities
- D. Vector quantities
31. The energy possessed by a body due to its motion is
- A. Kinetic energy**
- B. Potential energy
- C. Internal energy
- D. Chemical energy
32. A rectangular block has dimension 1.0m x 1.5m x 2.0m. If the density of the block is 3000kg/m³. Find its mass in kg.
- A. 9.0 X 10³**
- B. 1.0 X 10³
- C. 9.0 X 10⁻³
- D. 1.0 X 10⁻³
33. The unit of force is a
- A. Kilogram
- B. Newton**
- C. Meters per second
- D. Coulombs
34. Which of the following affects the moment of a force?
- A. Magnitude of the force**
- B. Cross-sectional area of the object
- C. Shape of the object
- D. Nature of the object
35. A force that gives a body of mass 1kg an acceleration of 1ms⁻² is called
- A. weight
- B. Newton**
- C. gravity
- D. D. friction
36. Convex mirrors are used as driving mirrors because they
- A. Have a wide field of view**
- B. Form magnified images
- C. Form real images
- D. Have a narrow field of view
37. The rate of change of distance moved in a specified direction is called
- A. Momentum
- C. Velocity**
- B. Acceleration
- D. Displacement
38. Hooke's law states that

- A. The rate of change of momentum is proportional to the applied force
- B. The current through a metallic conductor is proportional to the potential difference at constant temperature
- C.** The extension of a wire is proportional to the force applied if the elastic limit is not exceeded
- D. Volume is proportional to temperature at constant pressure

39. Which one of the following statements is true about cathode rays?

- A. They are positively charged
- B.** They are negatively charged
- C. They cannot be deflected by both electric and magnetic fields
- D. They possess both positive and negative charges

40. Which of the following are forms of mechanical energy?

- A. Electrical energy and kinetic energy
- B. Potential energy and nuclear energy
- C. Nuclear energy and kinetic energy
- D.** Potential energy and kinetic energy

SECTION B: (40 MARKS)

Answer all questions in this section. All working must be clearly shown in the spaces provided

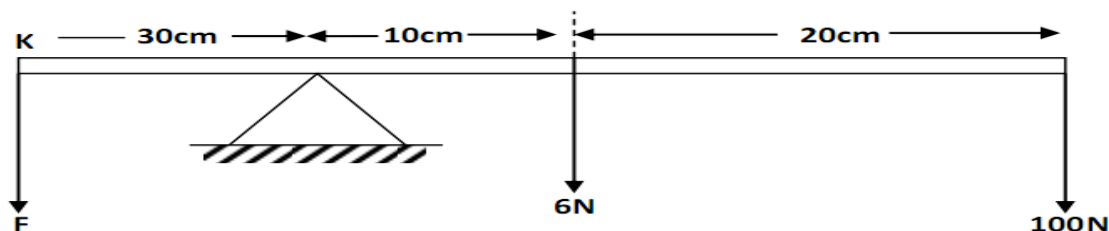
41. (a) State the principle of moments (01 mark)

It states that when a body is in equilibrium, the sum of the clockwise moments about any point is equal to the sum of anti-clockwise moments about the same point.

(b) State one condition for a body to be in equilibrium (01 mark)

- ❖ The sum of the forces one direction is equal to the sum of forces in the opposite direction.
 - ❖ The sum of the clockwise moments about any point is equal to sum of the anti-clockwise moments about the same point
- Any one

(c)



Find the force F if the body is in equilibrium (02 marks)

Taking moments about the pivot;

Sum of clockwise moments = sum of anti-clockwise moments

$$6 \times \frac{10}{100} + 100 \times \frac{30}{100} = F \times \frac{30}{100}$$

$$F = 102\text{N}$$

42. (a) Define work.

(01 mark)

Work is a product of force and the distance moved in the direction of the force.

(b) A body of mass 2kg is acted upon by a force 5N through a distance of 10m. Find the;

(i) acceleration of the body

(1.5 marks)

From $F = ma$,

$$a = \frac{F}{m} = \frac{5}{2}$$

$$a = 2.5\text{ms}^{-2}$$

(ii) work done by the force.

(1.5 marks)

Work done = force $\times$ distance

$$= 5 \times 10$$

$$\text{Work done} = 50\text{J}$$

43. (a) What is meant by the atomic number of an element?

(01 mark)

Atomic number is the number of protons in the nucleus of an atom of an element.

(b) One isotope of neon is denoted by ${}^{20}_{10}\text{Ne}$. How many neutrons does the isotope have? (01 mark)

Number of neutrons = atomic mass – atomic number

$$= 20 - 10$$

$$\text{Number of neutrons} = 10$$

(c) A radioactive isotope X with atomic mass 35 and atomic number 17 decays by emission of an alpha particle and gamma rays to form Y. Write a balanced equation for the nuclear equation. (02 marks)



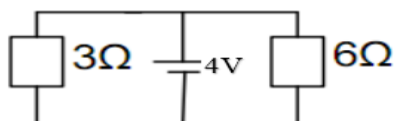
44. (a) State ohm's law

(01 mark)

It states that the current through a metallic conductor is directly proportional to the potential difference across its ends provided temperature and other physical conditions are kept constant.

Mark a candidate who uses 'wire' in stead of metallic conductor

(b) Two resistors of resistances 3Ω and 6Ω are connected across a battery of e.m.f 4V and negligible internal resistance as shown in the figure below



Find the;

(i) Combined resistance

(1.5 marks)

Since the resistors are in parallel,

$$R = \frac{3 \times 6}{3 + 6}$$

$$R = 2\Omega$$

(ii) Current supplied by the battery

(1.5 marks)

$$\text{From } E = I(R + r)$$

$$4 = I(2 + 0)$$

$$I = 2A$$

Deduct 0.5 marks if a candidate uses $V = IR$ because the cell has internal resistance, r , which must appear in the formula

45. (a) What is meant by the term momentum?

(01 mark)

Momentum is the product of mass of a body and its velocity.

But not 'product of mass and its velocity'

(b) A car starts from rest and acquire a velocity of 60ms^{-1} in 30s.

Find the acceleration of the car

(03 marks)

$$u = 0 \text{ (since the car started from rest)}$$

$$v = 60\text{ms}^{-1}$$

$$t = 30\text{s}$$

$$\text{from } v = u + at,$$

$$60 = 0 + a \times 30$$

$$a = 2\text{ms}^{-2}$$

46. (a) State the law of conservation of energy

(01 mark)

It states the energy is neither created nor destroyed but changes from one form to another.

(b) A block of mass 2kg falls freely from rest through a height of 20cm above the ground. Find;

(i) The potential energy of the block above the ground

(1.5 marks)

$$m = 2\text{kg}$$

$$u = 0 \text{ (falls from rest)}$$

$$h = 20\text{cm} = 0.2\text{m}$$

$$g = 10\text{ms}^{-2}$$

$$\text{Potential energy} = mgh$$

$$= 2 \times 10 \times 0.2$$

$$\text{Potential energy} = 4\text{J}$$

(ii) The velocity with which the block hits the ground

(1.5 marks)

From the principle of conservation of energy;

Loss in potential energy = gain in kinetic energy

Therefore, kinetic energy = 4J

$$\text{But kinetic energy} = \frac{1}{2}mv^2$$

$$4 = \frac{1}{2} \times 2 \times v^2$$

$$v = 2\text{ms}^{-1}$$

47. (a) What is power?

(01 mark)

Power is the rate of transfer of energy

Or power is the rate of doing work.

- (b) A boy whose mass is 60kg can run up a flight of 28 steps each 25cm in 55 seconds. Calculate the power he develops. (03 marks)

$$\text{Total distance moved} = (28 \times 25)\text{cm}$$

$$= 700\text{cm} = 7\text{m}$$

$$t = 55\text{s}$$

$$m = 60\text{kg}$$

$$\text{Power} = \frac{\text{work done}}{\text{time taken}}$$

$$\text{But work done} = \text{force} \times \text{distance}$$

$$\text{Force} = mg$$

$$F = 60 \times 10 = 600\text{N}$$

$$\text{Work done} = 600 \times 7 = 4200\text{J}$$

$$\text{Power} = \frac{4200}{55}$$

$$\text{Power developed} = 76.4\text{W}$$

48. (a) Define the term pressure. (01 mark)

Pressure is the force acting normally per unit area

Or pressure is the force acting normally per square metre of the surface.

- (b) The dimension of a cuboid is 5cm×10cm×20cm and weight of a cuboid is 60N. Calculate

- (i) Maximum pressure it exerts (1.5 marks)

$$\text{Maximum pressure} = \frac{\text{force}}{\text{minimum area}}$$

$$\text{Minimum area} = \frac{5}{100} \times \frac{10}{100} = 0.005\text{m}^2$$

$$\text{Maximum pressure} = \frac{60}{0.005}$$

$$= 12000\text{Pa}$$

- (ii) Minimum pressure it exerts. (1.5 marks)

$$\text{Minimum pressure} = \frac{\text{force}}{\text{maximum area}}$$

$$\text{Maximum area} = \frac{20}{100} \times \frac{10}{100} = 0.02\text{m}^2$$

$$\text{Minimum pressure} = \frac{60}{0.02}$$

$$= 3000\text{Pa}$$

49. (a) Differentiate between vector and scalar quantities (02 marks)

Vector quantities are quantities that have both magnitude and direction whereas scalar quantities are quantities that have only magnitude

- (b) Give two examples of;

- (i) Vector quantities (01 mark)

❖ Momentum, velocity, acceleration, weight, force **Any two**

(ii) Scalar quantities

(01 mark)

❖ Mass, time, temperature, area, volume, density **Any two**

50. (a) What is meant by focal length of a concave mirror?

(01 mark)

This is the distance between the principal focus and the pole of the mirror

(b) An object of height 3cm is placed 20cm in front of a concave mirror of focal length 10cm. Find the position of the image and the magnification produced. **(03 marks)**

$$h_0 = 3\text{cm}$$

$$u = 20\text{cm}$$

$$f = 10\text{cm}$$

$$\text{from } \frac{1}{f} = \frac{1}{u} + \frac{1}{v},$$

$$\frac{1}{10} = \frac{1}{20} + \frac{1}{v}$$

$$v = 20\text{cm}$$

$$\text{magnification, } m = \frac{v}{u} = \frac{20}{20}$$

$$m = 1$$

END