CANDIDATE – PLEASE NOTE!

PRINT your name on the line below and return this booklet with your answer sheet. Failure to do so may result in disqualification.

FORM TP 02025025

TEST CODE **01238010**

JANUARY 2025

CARIBBEAN EXAMINATIONS COUNCIL

CARIBBEAN SECONDARY EDUCATION CERTIFICATE® EXAMINATION

PHYSICS

Paper 01 – General Proficiency

1 hour 15 minutes

20 JANUARY 2025 (a.m.)

744

READ THE FOLLOWING INSTRUCTIONS CAREFULLY.

1. This test consists of 60 items. You will have 1 hour and 15 minutes to answer them.
2. In addition to this test booklet, you should have an answer sheet.
3. Each item in this test has four suggested answers lettered (A), (B), (C), (D). Read each item you are about to answer and decide which choice is best.
4. On your answer sheet, find the number which corresponds to your item and shade the space having the same letter as the answer you have chosen. Look at the sample item below.

Sample Item

The SI unit of length is the

(A) metre
(B) second
(C) newton
(D) kilogram

Sample Answer

● Ⓑ Ⓒ Ⓓ

A000

The best answer to this item is "metre", so (A) has been shaded.

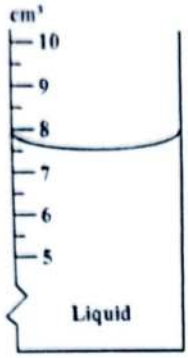
5. If you want to change your answer, erase it completely before you fill in your new choice.
6. When you are told to begin, turn the page and work as quickly and as carefully as you can. If you cannot answer an item, go on to the next one. You may return to that item later.
7. You may do any rough work in this booklet.
8. Figures are not necessarily drawn to scale.
9. You may use a silent, non-programmable calculator to answer items.

DO NOT TURN THIS PAGE UNTIL YOU ARE TOLD TO DO SO.

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Item 1 refers to the following measuring cylinder which is used to determine the volume of a liquid.



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1. The volume of the liquid is

(A) 7.0 cm³
(B) 7.5 cm³
(C) 7.8 cm³
(D) 8.0 cm³

2. In an experiment to locate the centre of gravity of a sheet of cardboard, a plumb line (string with a small mass on the end) is used. The plumb line is used to

(A) check that the apparatus is vertical
(B) measure the width of the cardboard
(C) check that the cardboard is swinging freely
(D) show which points are vertically below the pivot

A003

3. Which of the following expressions could be used to determine the speed of an object?

(A) $\frac{\text{Change in velocity}}{\text{Time taken}}$

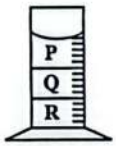
(B) $\frac{\text{Change in displacement}}{\text{Time taken}}$

(C) $\frac{\text{Distance travelled}}{\text{Time taken}}$

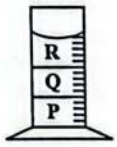
(D) Distance travelled × Time taken

4. Three immiscible liquids, P, Q and R, have densities which differ. Q is denser than P but less dense than R.

Which of the following diagrams shows how the liquids settle in the measuring cylinder?

(A)


(B)


(C)


(D)


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5. When two bodies collide, momentum is conserved. This means that the

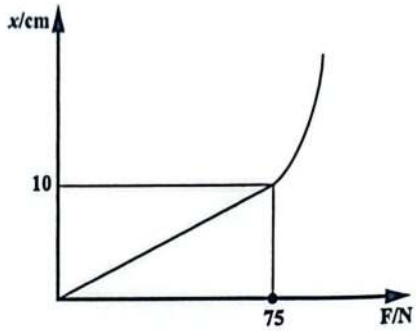
(A) momentum of each body is unchanged
(B) kinetic energy before impact is equal to that after impact
(C) algebraic sum of the velocities before impact is equal to the sum of the velocities after impact
(D) total momentum of the bodies before impact is equal to the total momentum of the bodies after impact

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6. Errors due to parallax can be minimized by

(A) taking an average of two readings using two separate scales
(B) placing the eye at right angles to the mark being read
(C) taking readings from different angles
(D) taking more than one reading

Item 7 refers to the following graph of a light spring which shows a simple extension, x, versus force, F.



7. Which of the following statements are true about the spring above?

I. The elastic limit of the spring was exceeded.
II. The spring obeyed Hooke's law over its entire extension.
III. The force per unit extension in the elastic region was 7.5 N cm^{-1}.

(A) I and II only
(B) I and III only
(C) II and III only
(D) I, II and III

A000

8. The moment of a force is defined as the

(A) moment in time when a force is first applied to a body
(B) length of time for which a force is applied to a body
(C) ratio of the force and its perpendicular distance from the turning point
(D) product of the force and its perpendicular distance from the turning point to the force

9. A glass marble, X, moving with a speed of 6 m s^{-1}, collides 'head on' with an identical stationary glass marble, Y. What is the speed of Y after collision, assuming that X is brought to rest?

(A) 0 m s^{-1}
(B) 3 m s^{-1}
(C) 6 m s^{-1}
(D) 12 m s^{-1}

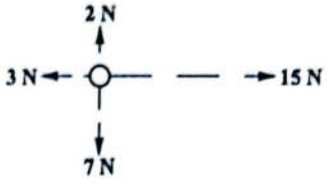
10. An object with a mass of 45 g is lowered into a measuring cylinder containing 45 cm^3 of water. When the object comes to rest at the bottom of the cylinder, the volume reading on the measuring cylinder rises to 75 cm^3. What is the density of the object?

(A) 1.50 g cm^{-3}
(B) 1.30 g cm^{-3}
(C) 0.75 g cm^{-3}
(D) 0.67 g cm^{-3}

11. Power can be defined as

(A) force × distance moved
(B) work done × time
(C) $\frac{\text{force}}{\text{time}}$
(D) $\frac{\text{work done}}{\text{time}}$

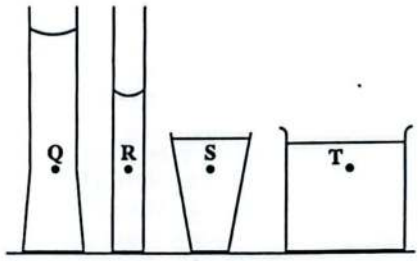
Item 12 refers to the following diagram that shows four forces acting on an object.



12. What is the magnitude of the resultant force acting on the object?

(A) 5 N
(B) 13 N
(C) 18 N
(D) 27 N

Item 13 refers to the following diagrams of four vessels, each filled with water.



13. The pressure due to the water is GREATEST at

(A) Q
(B) R
(C) S
(D) T

14. A student sets up a simple pendulum and finds that the period is 1.7 seconds. To obtain a period nearer to one second, he should

(A) use a lighter bob
(B) use a heavier bob
(C) shorten the pendulum
(D) lengthen the pendulum

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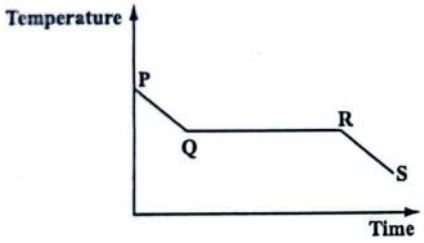
15. Which of the following quantities has the same value as 6 μC?

(A) 6×10^{-6} C
(B) 6×10^{-3} C
(C) 6×10^{3} C
(D) 6×10^{6} C

16. An ice cube sinks in Liquid A but floats in Liquid B. Which of the following statements is true?

(A) The upthrust is less in Liquid A than in Liquid B.
(B) The upthrust is greater in Liquid A than in Liquid B.
(C) The weight of the ice cube is less in Liquid A than in Liquid B.
(D) The weight of the ice cube is greater in Liquid A than in Liquid B.

Item 17 refers to the following graph which is based on an experiment on change of phase.



17. The graph shows that solidification started at Q. During which of the stages is the substance in the liquid phase?

(A) At P only
(B) Between Q and R
(C) Between R and S
(D) Between P and Q

18. The heat capacity of a substance is defined as the amount of heat energy

(A) the substance can hold
(B) 1 kg of the substance can hold
(C) required to change the substance to another state
(D) needed to raise the temperature of the substance by 1 degree

19. As the temperature of a liquid decreases, the

(A) forces between the molecules decrease
(B) kinetic energy of the molecules decreases
(C) liquid molecules move away from each other
(D) pressure it exerts at the bottom of the container increases

20. Which of the following play a role with respect to the greenhouse effect?

(A) Sound waves
(B) Water waves
(C) Infrared rays
(D) Gamma rays

21. A student wants to conduct an experiment to determine the specific heat capacity, c, of a solid using the electrical method.
Which of the following equations should be used?

(A) $c = \frac{IVt}{m\Delta\theta}$

(B) $c = \frac{F \times D}{m\Delta\theta}$

(C) $c = \frac{m\Delta\theta}{PI}$

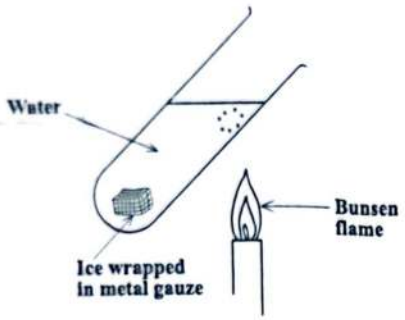
(D) $c = \frac{m\Delta\theta}{IVt}$

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22. A gas occupies 2 m³ at 27 °C at a pressure of 1 atmosphere. At a pressure of 2 atmospheres it occupies a volume of 1 m³. What is its temperature at this new volume and pressure?

(A) −198.0 °C
(B) 6.75 °C
(C) 27.0 °C
(D) 54.0 °C

Item 23 refers to the following diagram which shows water boiling at the top of a glass test tube while a piece of ice remains unmelted at the bottom.



23. Which of the following statements provides the reason for this occurrence?

(A) Water is a poor conductor of heat.
(B) Water is a good conductor of heat.
(C) Gauze is a poor conductor of heat.
(D) Glass is a good conductor of heat.

24. Which of the following is NOT an example of evaporation?

(A) A copper wire placed around a block of ice gradually cuts through the ice.
(B) The rapid disappearance of ether when exposed to the air.
(C) A slice of bread left in the open air becomes dry.
(D) The cooling effect of sweating in animals.

25. Which of the following are reasons why a hot liquid, placed in a double-walled vacuum flask, retains its heat for a long time?

I. The silver inner walls reduce the loss of heat by radiation.
II. The silvered outer wall helps to absorb heat from the surroundings.
III. Evacuated space between the double walls reduces the loss of heat by conduction.

(A) I and II only
(B) I and III only
(C) II and III only
(D) I, II and III

26. A detector of thermal energy is placed an equal distance in turn from each of four vertical faces of a hollow metal cube full of hot water. The reading on the detector is GREATEST when the detector is turned towards the face which is

(A) painted shiny white
(B) painted dull black
(C) highly polished
(D) painted silver

27. The energy required to change the state of a substance was determined to be E_H. If the mass of the substance is DOUBLED, the value of E_H will

(A) remain constant
(B) be quadrupled
(C) be doubled
(D) be halved

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28. According to the principles of heat transfer, which of the following statements is INCORRECT?

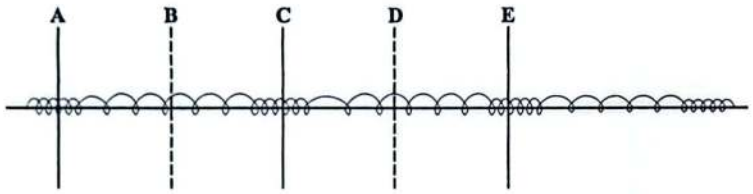
(A) The process of heat transfer is irreversible.
(B) For heat exchange, a temperature gradient must exist.
(C) A material medium is not necessary for heat transmission.
(D) Heat flows in bodies even if there is no temperature difference.

29. Which of the following statements concerning characteristics of steel and iron is correct?

(A) Iron is easily magnetized whereas steel does not retain its magnetism.
(B) Iron is easily magnetized whereas steel retains its magnetism well.
(C) Iron is not easily magnetized whereas steel retains its magnetism well.
(D) Iron is not easily magnetized whereas steel does not retain its magnetism.

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Item 30 refers to the following diagram which illustrates a longitudinal wave train produced on a slinky.



30. Which of the following distances represents the wavelength of the vibration?

(A) A to B
(B) A to E
(C) C to E
(D) D to E

A000

31. If sounds of differing frequencies are played in succession, in which of the following properties would a change be detected?

(A) Pitch
(B) Speed
(C) Loudness
(D) Wavelength

32. Which of the following types of electromagnetic radiation causes tanning?

(A) Light
(B) X-ray
(C) Infrared
(D) Ultraviolet

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33. Which of the following are laws of refraction?

I. $\frac{\sin i}{\sin r}$ = constant

II. Angle of incidence = angle of refraction

III. The incident ray, the refracted ray and the normal, at the point of incidence, all lie in the same plane.

(A) I and II only
(B) I and III only
(C) II and III only
(D) I, II and III

34. The note from a drum is louder when it is struck harder because the sound waves produced have a greater

(A) velocity
(B) frequency
(C) amplitude
(D) wavelength

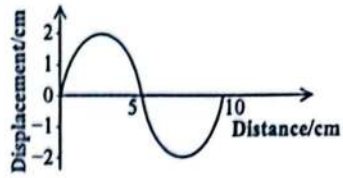
Item 35 refers to the following table which lists the refractive indices of four different materials.

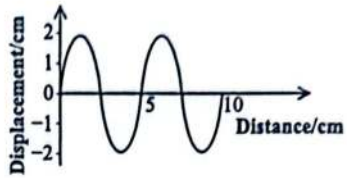
Material	Refractive Index
Air	1.0
Ice	1.3
Perspex	1.5
Diamond	2.4

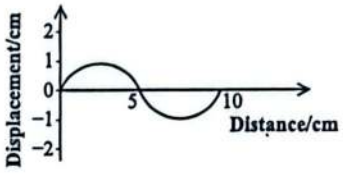
35. In which material would light waves have the SLOWEST speed?

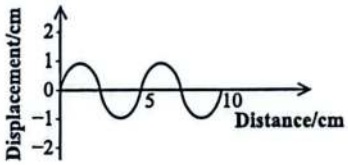
(A) Air
(B) Ice
(C) Perspex
(D) Diamond

36. A wave has wavelength 5 cm and amplitude 2 cm. Which of the following diagrams represents the wave?

(A)


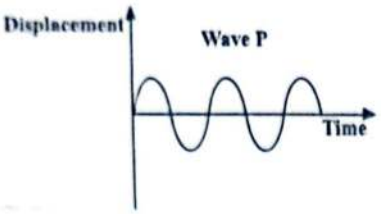
(B)


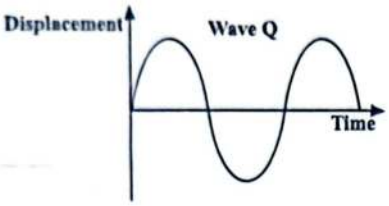
(C)


(D)


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Item 37 refers to the following graphs (with axes having the same scales) of two sound waves, P and Q.

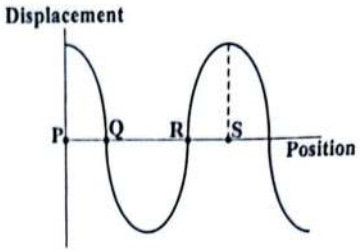




37. Which of the following statements about the two waves is true?

(A) Q is louder than P but P has a higher pitch.
(B) P is louder than Q but Q has a higher pitch.
(C) P is louder than Q and also has a higher pitch than Q.
(D) Q is louder than P and also has a higher pitch than P.

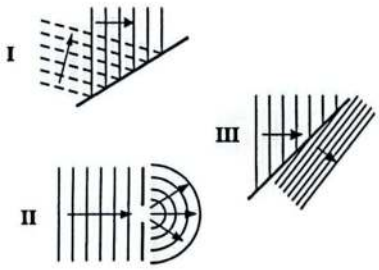
Item 38 refers to the following diagram which shows a transverse wave at a particular instant.



38. The wavelength of the wave is equal to the distance

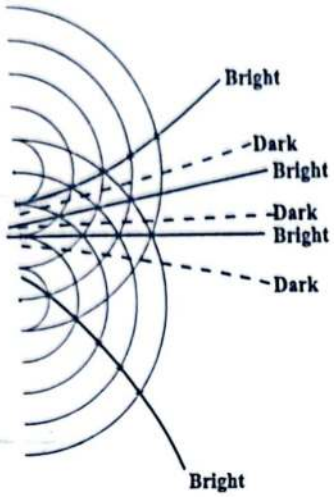
(A) RS
(B) QS
(C) PR
(D) PS

39. Which of the following diagrams represent(s) the diffraction of water waves in a ripple tank?



(A) I only
(B) II only
(C) I and II only
(D) II and III only

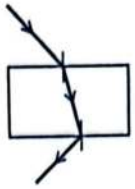
Item 40 refers to the following diagram in which two coherent light sources produce an interference pattern on a screen of bright and dark fringes.

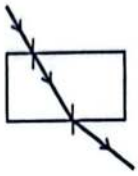


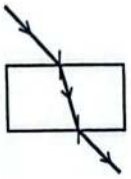
40. The reason for the formation of the bright fringes is that

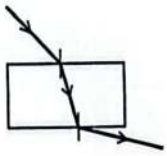
(A) these positions contain more light energy
(B) all the crests are in phase along these points
(C) the crests are larger than the troughs along these lines
(D) all the crests and troughs are out of phase along these points

41. Which diagram BEST shows the path taken by a ray of light through a rectangular glass block?

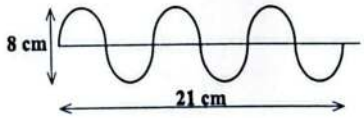
(A)


(B)


(C)


(D)


Item 42 refers to the following diagram which illustrates the side view of a water wave.



42. The amplitude of the wave is

(A) 4 cm
(B) 7 cm
(C) 8 cm
(D) 21 cm

43. Which of the following statements about insulators are true?

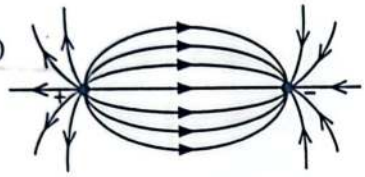
I. All electrons are bound firmly to the atoms in an insulator.
II. In an insulator many electrons can move freely from atom to atom.
III. An insulator could be charged by rubbing.

(A) I and II only
(B) I and III only
(C) II and III only
(D) I, II and III

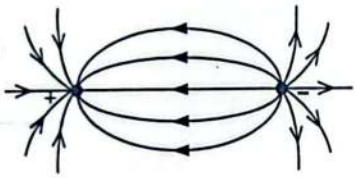
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44. Which of the following diagrams represents the electric field that exists between two oppositely charged point charges?

(A)



(B)

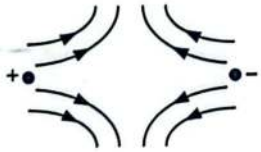


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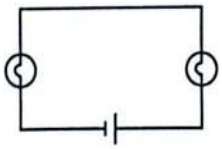
(C)



(D)

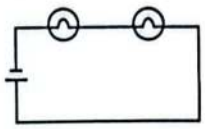


Item 45 refers to the diagram below which shows an electrical circuit with a cell and two filament bulbs.

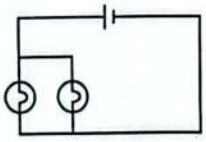


45. Which of the following circuits is electrically the same as the circuit above?

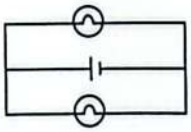
(A)



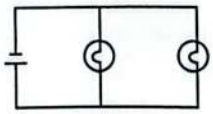
(B)



(C)



(D)

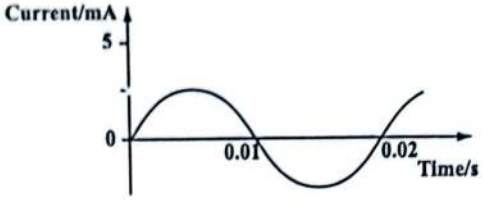




Item 46 refers to the following graphs which represent two alternating currents.



I

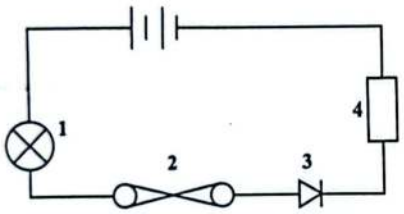


II

46. Which of the following combinations correctly identifies the currents?

	Current with Greater Frequency	Current with Greater Peak Value
(A)	I	II
(B)	I	Neither
(C)	Neither	I
(D)	II	Neither

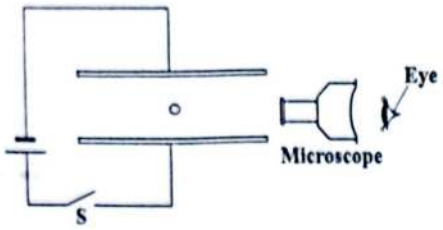
Item 47 refers to the following circuit diagram.



47. Which of the following options shows the name of each component correctly matched with its number?

	Diode	Lamp	Resistor	Fuse
(A)	2	4	3	1
(B)	1	3	4	2
(C)	4	3	1	2
(D)	3	1	4	2

Item 48 refers to the following diagram which shows a small, NEGATIVELY charged dust particle, midway between two plates, being observed with a microscope.

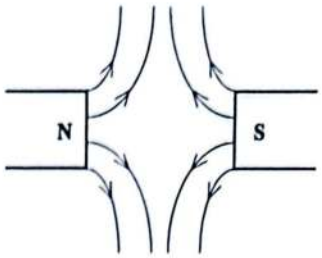


48. Which of the following arrows correctly indicates the direction of the movement of the dust particle when the switch, S, is closed?

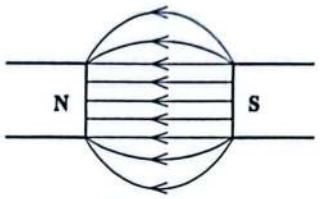
(A) →
(B) ←
(C) ↓
(D) ↑

49. Which of the following diagrams represents the magnetic field which exists between two opposite magnetic poles?

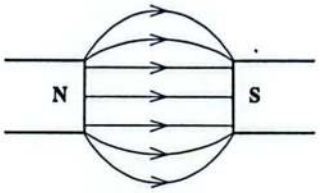
(A)



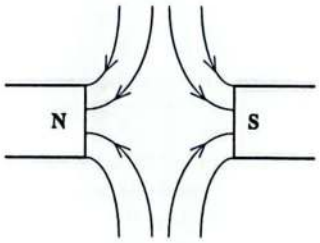
(B)



(C)

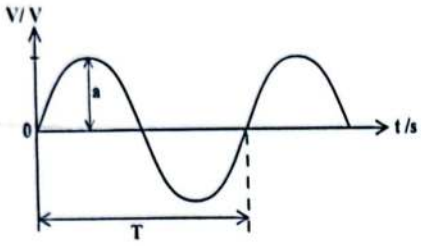


(D)



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Item 50 refers to the following voltage–time graph.



50. The frequency of the voltage–time graph is given by

(A) a

(B) $\frac{1}{a}$

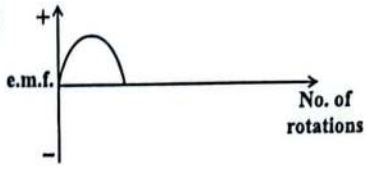
(C) T

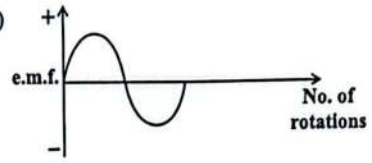
(D) $\frac{1}{T}$

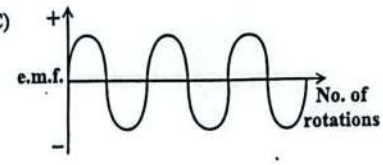
51. Magnetic induction occurs when

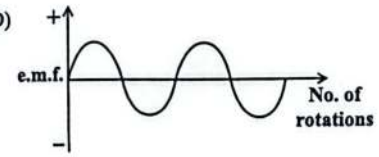
(A) an electroscope is charged
(B) an N pole attracts an S pole
(C) iron nails near a magnet become magnetized
(D) a magnet is suspended and points in the NS direction

52. For a simple AC generator, which of the following graphs would be produced by two complete rotations of the armature?

(A)


(B)


(C)


(D)


53. An ammeter has a very low resistance so that it can be placed in

(A) parallel with a component and not affect the circuit
(B) series with a component and not affect the circuit
(C) parallel with a component and not heat up
(D) series with a component and not heat up

54. According to the Rutherford–Bohr model of a neutral, stable atom, if

n = number of neutrons,
p = number of protons, and
e = number of electrons in the atom,

then for all elements

(A) $p = e$
(B) $n = e$
(C) $n + e = p$
(D) $n + p = e$

55. Which of the following statements about radioisotopes is true?

(A) They are not used in scientific work because they are too dangerous.
(B) They are most frequently used in radio communications.
(C) They are sometimes used in medicine.
(D) They are never found to occur naturally.

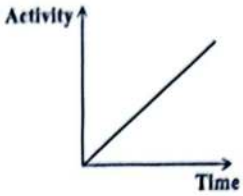
56. Which of the following describes two properties of an α-particle?

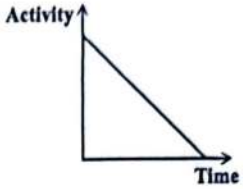
(A) No charge, very penetrating
(B) Positive charge, very penetrating
(C) Positive charge, not very penetrating
(D) Negative charge, not very penetrating

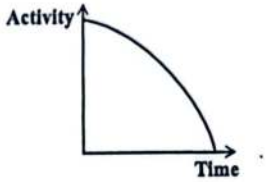
57. Which of the following scientists discovered radium?

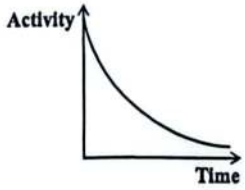
(A) Marie Curie
(B) Isaac Newton
(C) J.J. Thompson
(D) Albert Einstein

58. Which of the following graphs shows how the activity of a radioactive source varies with time?

(A)


(B)


(C)


(D)


59. Which of the following equations is correct?

(A) $^{226}_{88}Ra \rightarrow {}^{222}_{86}Rn$ + β-particle

(B) $^{14}_{6}C \rightarrow {}^{15}_{7}N$ + β-particle

(C) $^{226}_{88}Ra \rightarrow {}^{222}_{86}Rn$ + α-particle

(D) $^{14}_{6}C \rightarrow {}^{15}_{7}N$ + α-particle

60. In the scattering experiment conducted by Geiger and Marsden, some of the alpha particles were deflected. The explanation for this phenomenon is that

(A) electrons have a small mass
(B) electrons have a small charge
(C) the metal foil was only a few atoms thick and most of the atom is empty space
(D) the nuclear charge and the mass are concentrated in a small volume in the atom

744

A000

END OF TEST

IF YOU FINISH BEFORE TIME IS CALLED, CHECK YOUR WORK ON THIS TEST.



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