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.

TEST CODE **01238010**

FORM TP 2022102

MAY/JUNE 2022

CARIBBEAN EXAMINATIONS COUNCIL

CARIBBEAN SECONDARY EDUCATION CERTIFICATE® EXAMINATION

PHYSICS

Paper 01 – General Proficiency

1 hour 15 minutes

01 JUNE 2022 (p.m.)

680

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

   ● Ⓑ Ⓒ Ⓓ

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

A017

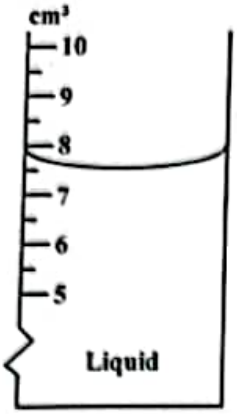
5. If you want to change your answer, erase it completely before you fill in your new choice.
6. When you are told to begin, turn the page and work as quickly and as carefully as you can. If you cannot answer an item, go on to the next one. You may return to that item later.
7. Figures are not necessarily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



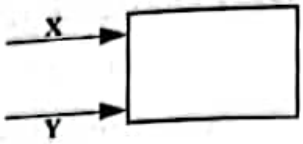
1. The volume of the liquid is

(A) 7.0 cm^3
(B) 7.5 cm^3
(C) 7.8 cm^3
(D) 8.0 cm^3

2. Given that force = mass × acceleration, the unit of force could be written as

(A) $kg^{-1}\ m\ s^2$
(B) $kg\ m^{-1}\ s^2$
(C) $kg\ m^{-1}\ s^{-2}$
(D) $kg\ m\ s^{-2}$

Item 3 refers to the following diagram which shows two forces, X and Y, applied onto an object.



3. What should be the magnitude and direction of a third force which will cause the object to remain stationary?

(A) $X - Y$ to the left
(B) $X + Y$ to the left
(C) $X - Y$ to the right
(D) $X + Y$ to the right

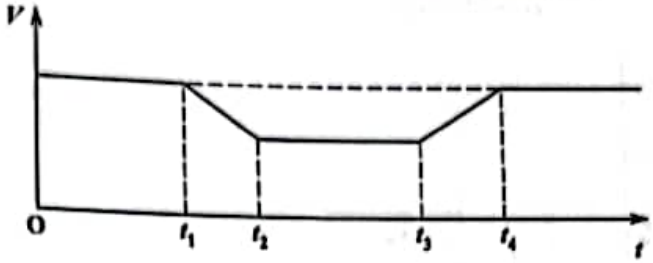
4. A diving ball is to be used at great depths and so its walls are made thick. The MAIN reason for this is that

(A) water pressure increases with depth
(B) water is much colder at greater depths
(C) a thin-walled vessel would float up to the surface
(D) the density of water is much greater at great depths

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Item 5 refers to the following diagram which shows a velocity/time graph for a moving object.



5. Which of the following statements about the object are true?

I. It returns to its starting point.
II. It has zero acceleration between times t_2 and t_3.
III. Its velocity at t_4 is the same as its initial velocity.

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

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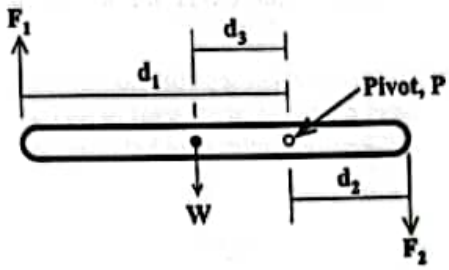
6. The unit for momentum is

(A) $kg\ s^{-1}$
(B) $kg\ m\ s^{-1}$
(C) $kg\ m\ s^{-2}$
(D) N m

7. A 4 kg mass is travelling with a constant speed of 5 $m\ s^{-1}$. It is brought to rest in 2 seconds. The average force acting on it to bring it to rest is

(A) 1.6 N
(B) 2.5 N
(C) 10.0 N
(D) 40.0 N

Item 8 refers to the following diagram which shows a non-uniform bar pivoted at P. W indicates the weight of the bar and forces F_1 and F_2 are applied at the positions shown.

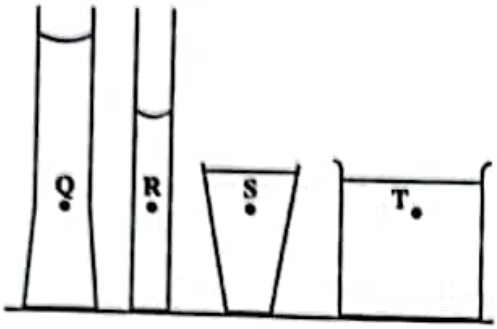


8. The sum of the clockwise moments about P equals

(A) $F_2 d_2$
(B) $F_1 d_1 + W d_3$
(C) $(F_1 + W)(d_1 + d_3)$
(D) $F_1 d_1 + F_2 d_2$

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Item 9 refers to the following diagrams of four vessels, each filled with water.



9. The pressure due to the water is GREATEST at

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

10. A piece of string is tied onto a small stone and then the stone is totally immersed in water. The tension in the string will be

(A) zero
(B) equal to the weight of the stone
(C) less than the weight of the stone
(D) more than the weight of the stone

11. Which of the following properties remains unchanged in a substance with an INCREASE in temperature?

(A) Mass
(B) Density
(C) Volume
(D) Relative density

12. When a ball is thrown vertically upwards and reaches its maximum height, it has

(A) maximum kinetic energy and maximum potential energy
(B) maximum kinetic energy and minimum potential energy
(C) minimum kinetic energy and minimum potential energy
(D) maximum potential energy and minimum kinetic energy

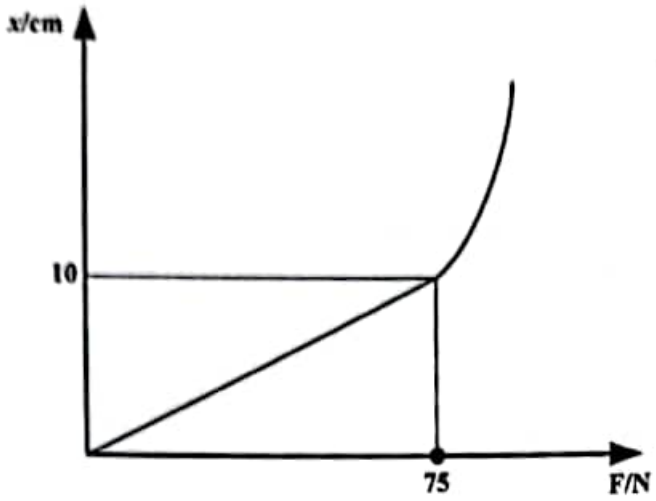
13. The time period of a simple pendulum oscillating with a small amplitude depends on the

(A) force with which the pendulum is set into motion
(B) amplitude of the oscillation
(C) length of the pendulum
(D) mass of the pendulum bob

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Item 14 refers to the following diagram which shows a simple extension (x) against Force (F) graph for a light spring.



14. Based on the graph above, which of the following statements would be true?

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

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15. Which of the following is an SI base unit?

(A) Volt
(B) Ohm
(C) Ampere
(D) Coulomb

16. Which of the following implements are designed to take advantage of a large moment provided by a relatively small force?

I. Crowbar
II. Claw hammer
III. Pair of tweezers

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

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17. There are NO attractive forces between the molecules in a

(A) solid and liquid
(B) liquid and gas
(C) liquid
(D) gas

18. Which of the following statements about the pressure law are true?

I. The ratio of pressure to Kelvin temperature is constant.
II. Volume is constant.
III. Pressure is constant.

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

19. Which of the following ranges of temperature is MOST suitable for a clinical thermometer?

(A) 0 °C to 44 °C
(B) −10 °C to 110 °C
(C) 35 °C to 100 °C
(D) 35 °C to 44 °C

20. The specific latent heat of vaporization of water is the energy required to change 1 kg of water at

(A) 0 °C to ice at 0 °C
(B) 0 °C to steam at 100 °C
(C) 100 °C to steam at 100 °C
(D) 99.9 °C to steam at 100.1 °C

21. 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

22. A metal of mass m requires energy, E, to raise its temperature from T_1 to T_2. The specific heat capacity of the metal will be given by

(A) $\frac{E}{mT_2}$

(B) $\frac{Em}{(T_1 - T_2)}$

(C) $\frac{E}{m(T_1 - T_2)}$

(D) $\frac{E}{m(T_2 - T_1)}$

23. Which of the following materials is BOTH a good absorber and a good emitter of thermal (heat) energy?

(A) A flat, polished metal plate
(B) A polished, convex metal plate
(C) A polished, concave metal plate
(D) A flat metal plate, painted black

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24. The specific latent heat of vaporization of water is 2.26×10^6 J kg $^{-1}$. When 0.01 kg of water is converted into steam, it

(A) absorbs 2.26×10^4 J
(B) gives out 2.26×10^4 J
(C) absorbs 2.26×10^8 J
(D) gives out 2.26×10^8 J

25. Which of the following diagrams BEST illustrates convection current in a liquid?

(A)



(B)



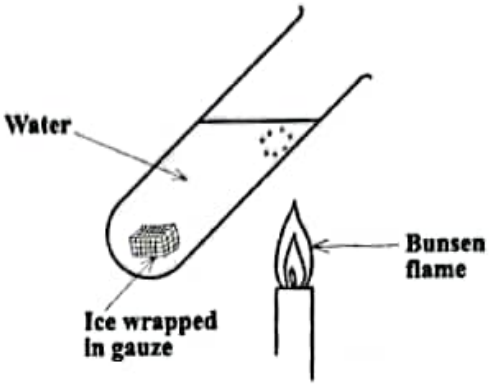
(C)



(D)



Item 26 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.



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

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

27. Two types of radiation, L and R, fall on a woman's left and right hands respectively. Her left hand feels hot but does not become tanned; her right hand does not feel hot but it eventually becomes tanned. Radiations L and R are

	L	R
(A)	visible light	X-rays
(B)	X-rays	visible light
(C)	ultraviolet	infrared
(D)	infrared	ultraviolet



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

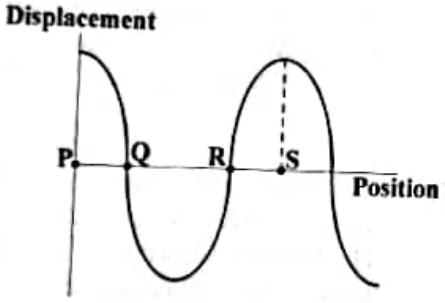
(A) $c = \frac{M\Delta\theta}{PI}$

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

(C) $c = \frac{IVt}{M\Delta\theta}$

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

Item 29 refers to the following diagram which shows a transverse wave at a particular instant.



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

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

30. Which of the following equations expresses the correct relationship between the wavelength, λ, speed, v, and frequency, f, of a wave?

(A) $f = \frac{v}{\lambda}$

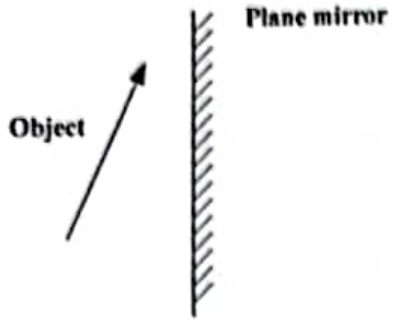
(B) $f = \frac{\lambda}{v}$

(C) $\lambda = fv$

(D) $\lambda = \frac{f}{v}$

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Item 31 refers to the following diagram which shows an object in front of a plane mirror.



31. Which of the following options BEST represents the image produced by the plane mirror?

(A)



(B)



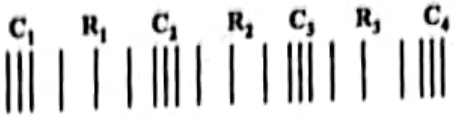
(C)



(D)



Item 32 refers to the following diagram which shows a longitudinal wave, where C and R represent compressions and rarefractions respectively.



32. If λ = wavelength, the distance between C_1 and R_2 is

(A) $\frac{1}{2}\lambda$

(B) 1λ

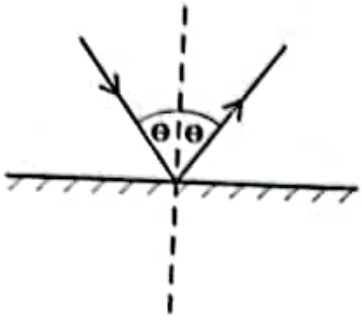
(C) $1\frac{1}{2}\lambda$

(D) 2λ

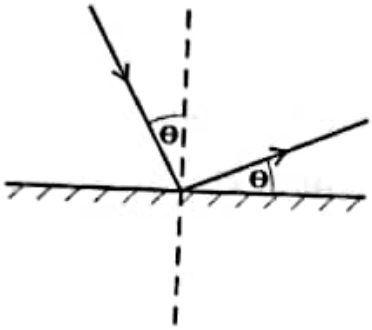
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33. Which of the following diagrams illustrates the law of reflection?

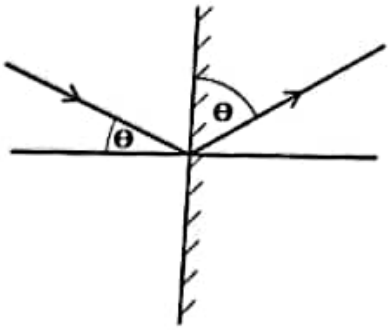
(A)



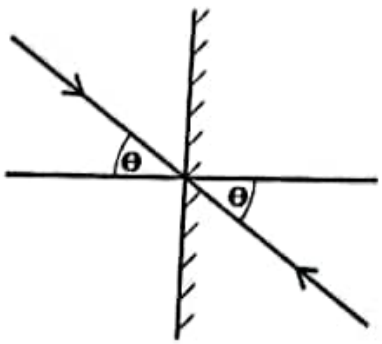
(B)



(C)



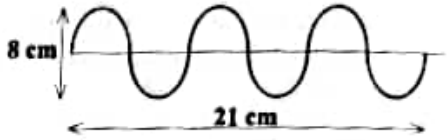
(D)



34. Which of the following properties is true of BOTH light waves and sound waves?

(A) They are electromagnetic waves.
(B) They are longitudinal waves.
(C) They may be transmitted through a vacuum.
(D) They undergo refraction.

Item 35 refers to the following diagram which illustrates the side view of a water wave.



35. The amplitude of the wave is

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

36. The refractive index of a transparent medium with a critical angle, c, for light travelling from the medium to air is

(A) $\frac{1}{c}$

(B) $\frac{\sin 90^\circ}{\sin c}$

(C) $\frac{90^\circ}{\sin c}$

(D) $\sin c$

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37. An explosion causes the emission of the following types of waves.

I. Light
II. Sound
III. Infrared

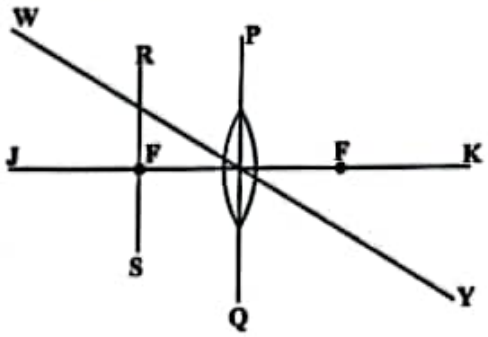
Which of these will be received first by a person some distance away from the source?

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

38. 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 39 refers to the following diagram.



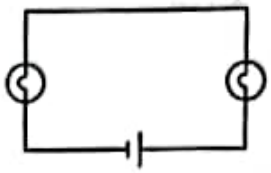
39. Which line lies along the principal axis of the converging lens?

(A) JK
(B) PQ
(C) RS
(D) WY

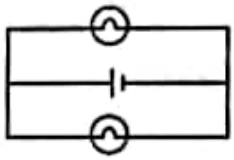
40. Rectification can BEST be done by using a

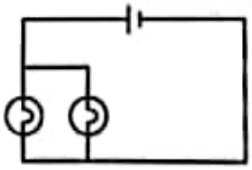
(A) transformer
(B) capacitor
(C) transistor
(D) diode

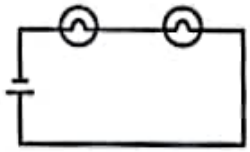
Item 41 refers to the following diagram which shows an electrical circuit with a cell and two filament bulbs.

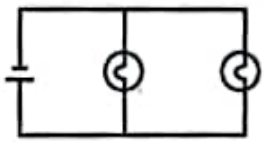


41. Which of the following circuits is electrically the same as the circuit above?

(A)


(B)


(C)


(D)


42. Given the following truth table with inputs A and B and output C, which logic gate does it describe?

A	B	C
0	0	1
0	1	1
1	0	1
1	1	0

(A) NAND
(B) NOR
(C) AND
(D) OR

43. Which of the following equations CANNOT be used to determine the power dissipated in a resistor?

(A) $P = I^2R$

(B) $P = VI$

(C) $P = \frac{R}{V^2}$

(D) $P = \frac{V^2}{R}$

44. Magnetic induction occurs when

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

45. Which of the following circuit symbols represents a fuse?

(A) 

(B) 

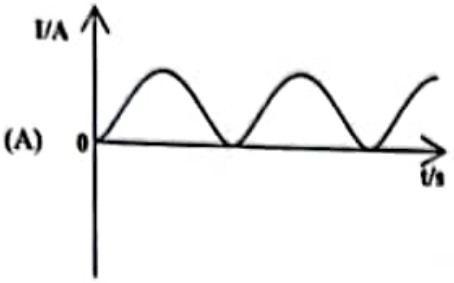
(C) 

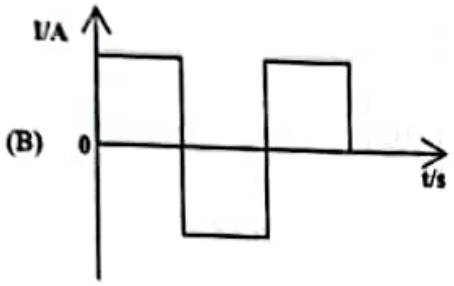
(D) 

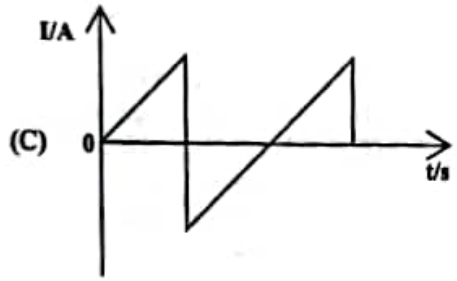
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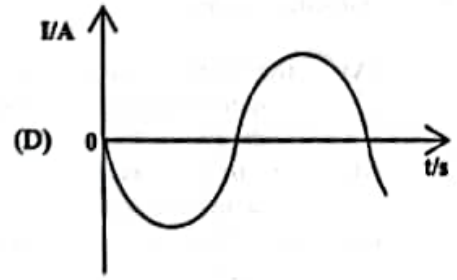
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46. Which of the following current (I)–time (t) graphs BEST represents a d.c. current?

(A)


(B)


(C)


(D)


47. Which of the following materials is MOST suitable for the core of an electromagnet?

(A) Steel
(B) Carbon
(C) Copper
(D) Soft iron

48. 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

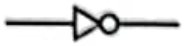
49. An ideal transformer has a primary to secondary turns ratio of 1:3. An alternating potential difference of 200 V is applied to the primary coil and a resistance of 200 Ω attached to the secondary coil. What is the current in the secondary circuit?

(A) 0.33 A
(B) 1.00 A
(C) 1.50 A
(D) 3.00 A



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50. Which of the following symbols represents the AND gate?

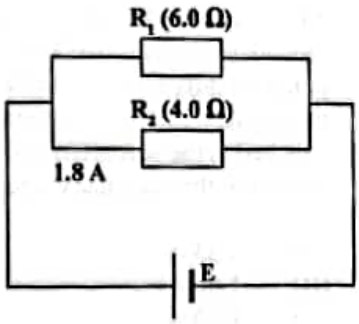
(A) 

(B) 

(C) 

(D) 

Item 51 refers to the following diagram which shows two resistors, R_1 of 6.0 Ω and R_2 of 4.0 Ω, in parallel.



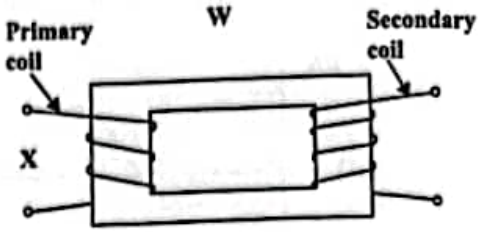
51. What is the current through R_1 if the current through R_2 is 1.8 A?

(A) 1.2 A
(B) 1.8 A
(C) 2.7 A
(D) 3.0 A

52. Which device allows one circuit to switch another circuit on or off without any direct contact between them?

(A) Magnetic relay
(B) Electromagnet
(C) Generator
(D) Motor

Item 53 refers to the following diagram.



53. Appropriate labels for device W and input X are

	W	X
(A)	step-down transformer	a.c. input
(B)	step-down transformer	d.c. input
(C)	step-up transformer	a.c. input
(D)	step-up transformer	d.c. input

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

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

55. Half-life is defined as

(A) the time it takes half of the radioactive atoms in a sample to decay
(B) the time it takes the radioactive atoms in a sample to decay
(C) half the time it takes a radioactive nucleus to decay
(D) half the lifetime of a radioactive sample

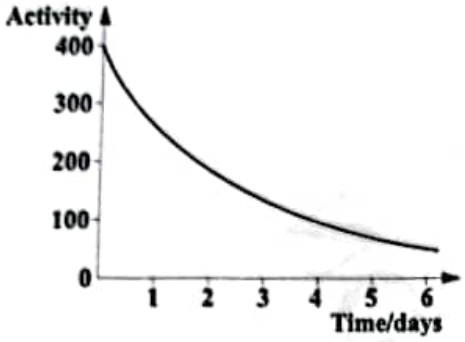
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Item 56 refers to the following information.

The activity of a radioactive substance was measured at suitable intervals over a period of days and its radioactive decay curve plotted as shown below.



56. The half-life of the radioactive substance is approximately

(A) 1 day
(B) 2 days
(C) 3 days
(D) 4 days

57. The nuclide $^{234}_{90}Th$ contains

(A) 90 protons and 234 neutrons
(B) 235 protons and 90 neutrons
(C) 90 protons and 144 neutrons
(D) 144 protons and 90 neutrons

58. Which of the following statements about radioactive decay are correct?

I. It is dependent on conditions external to the nucleus.
II. It is a random process.
III. It is due to changes in the nuclei of atoms.

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

59. Which of the following statements about a proton is NOT true?

(A) It is a hydrogen atom minus an electron.
(B) It has the same mass as that of an electron.
(C) It has a mass about 2000 times that of an electron.
(D) It has a charge equal in size but opposite in sign to that of an electron.

60. An isotope of uranium, $^{234}_{92}U$, changes to $^{230}_{90}Th$. This is an example of

(A) α decay
(B) β decay
(C) fission
(D) fusion

END OF TEST

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

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