

CARIBBEAN EXAMINATIONS COUNCIL
CARIBBEAN SECONDARY EDUCATION CERTIFICATE[®]
EXAMINATION

PHYSICS

Paper 01 – General Proficiency

1 hour 15 minutes

03 JUNE 2020 (p.m.)

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.

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.



1. The measurement of the external diameter of a measuring cylinder is MOST accurately done by using a
- (A) metre rule
 - (B) tape measure
 - (C) length of string
 - (D) pair of vernier callipers
2. Given that force = mass \times acceleration, the unit of force could be written as
- (A) $\text{kg}^{-1} \text{m s}^2$
 - (B) $\text{kg m}^{-1} \text{s}^2$
 - (C) $\text{kg m}^{-1} \text{s}^{-2}$
 - (D) kg m s^{-2}
3. 0.0000462 N expressed in standard form is
- (A) $4.62 \times 10^{-5} \text{ N}$
 - (B) $4.62 \times 10^{-4} \text{ N}$
 - (C) $462 \times 10^{-4} \text{ N}$
 - (D) $4.62 \times 10^5 \text{ N}$
4. The mass of an astronaut is 70 kg when standing on the moon. When he returns to Earth, his approximate weight will be
- (A) 70 kg
 - (B) 70 N
 - (C) 420 kg
 - (D) 700 N
5. 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) product of the force and its perpendicular distance from the turning point to the force
 - (D) ratio of the force and its perpendicular distance from the turning point
6. The unit for momentum is
- (A) kg s^{-1}
 - (B) kg m s^{-1}
 - (C) kg m s^{-2}
 - (D) N m
7. Which of the following remains unchanged with an INCREASE in temperature?
- (A) Mass
 - (B) Density
 - (C) Volume
 - (D) Relative density
8. 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 the mass to bring it to rest is
- (A) 1.6 N
 - (B) 2.5 N
 - (C) 10.0 N
 - (D) 40.0 N

GO ON TO THE NEXT PAGE

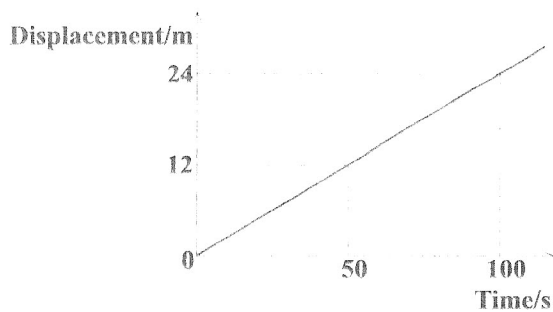


9. Which of the following measures may be classified as scalar quantities?

- I. Time
- II. Speed
- III. Displacement

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

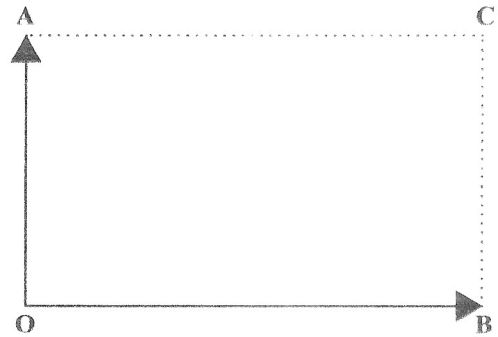
Item 10 refers to the following graph.



10. The graph above shows how the displacement of a runner from a starting line varies with time. This runner is

- (A) going slower and slower
- (B) going at a steady speed
- (C) going faster and faster
- (D) not moving

Item 11 refers to the following diagram which shows two vectors of magnitudes a and b represented respectively by \overline{OA} and \overline{OB} .



11. The vectors act at Point O and are perpendicular to each other. Which of the following pairs represents BOTH the magnitude and direction of their resultant?

	Magnitude	Direction
(A)	$a^2 + b^2$	\overline{OC}
(B)	$a + b$	\overline{CO}
(C)	$\sqrt{(a^2 + b^2)}$	\overline{CO}
(D)	$\sqrt{(a^2 + b^2)}$	\overline{OC}

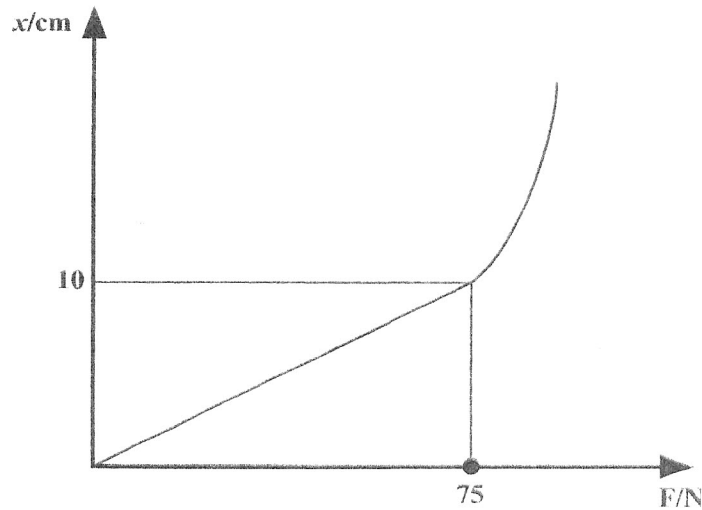
12. The acceleration due to gravity (g) is to be determined by measuring the time (t) taken for a small steel ball to fall through a specific height. Which of the following activities is UNNECESSARY?

- (A) Finding the mass of the ball
- (B) Allowing the ball to drop and starting the stopwatch at the same instant
- (C) Measuring the height through which the ball falls
- (D) Repeating the time measurements and taking the average

13. On which of the following features does the pressure at a point in a liquid depend?
- I. Density of the liquid
 - II. Depth from the surface
 - III. Area of the cross-section of the container

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

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?

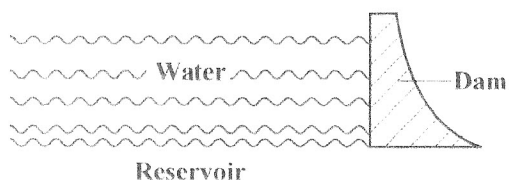
- I. The elastic limit of the spring was exceeded.
- II. The spring obeyed Hooke's law over its entire extension.
- III. The force per unit extension in the elastic region was 7.5 N cm^{-1} .

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

GO ON TO THE NEXT PAGE



Item 15 refers to the following diagram which shows a dam.



15. The pressure on the dam at the bottom of the reservoir depends on the

- (A) mass of water held back by the dam
- (B) volume of water held by the dam
- (C) length of the reservoir
- (D) depth of the water

16. A bubble of gas rises to the surface of a soft drink. This is because the

- (A) upthrust on the bubble is greater than the weight of the bubble
- (B) upthrust on the bubble is greater than the weight of water it displaces
- (C) weight of the water displaced by the bubble is less than the weight of the bubble
- (D) density of the gas is greater than the density of the drink

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

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

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

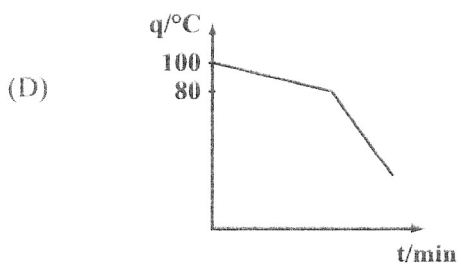
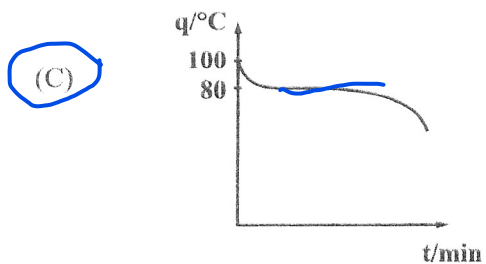
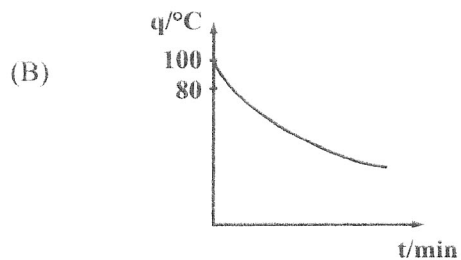
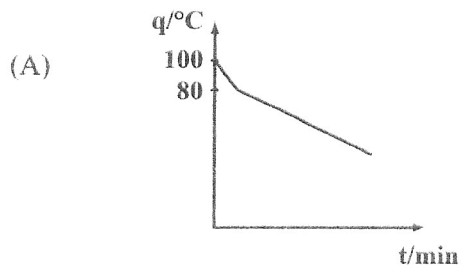
- I. The ratio of pressure to Kelvin temperature is constant.
- II. Volume is constant.
- III. Pressure is constant.

- (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 temperature ranges 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. Molten naphthalene at 100 °C is allowed to cool down to room temperature. If naphthalene has a melting point of 80 °C, which of the following graphs BEST represents the cooling curve?



21. The energy required to change the state of a substance was determined to be E_{11} . If the mass of the substance is DOUBLED, the value of E_{11} will

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

22. A light bulb is filled with a gas at a temperature of 293 K. If the initial pressure of the gas is P , what will the pressure be when the temperature increases to 360 K?

(A) $\frac{393}{360} \times P$

(B) $\frac{360}{293} \times P$

$$\frac{P_1}{293} = \frac{P_2}{360}$$

(C) $\frac{293}{360} \times P$

(D) $\frac{360}{393} \times P$

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

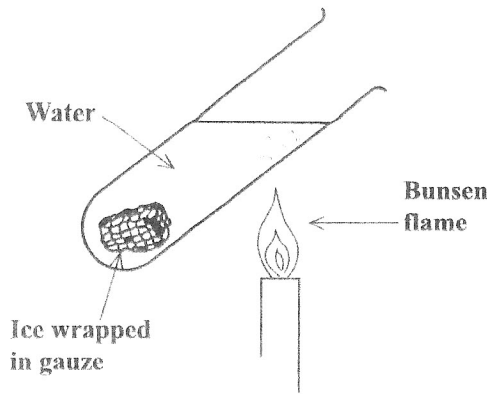
24. The specific latent heat of vaporization of water is the energy required to change 1 kg of water at

- (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

GO ON TO THE NEXT PAGE



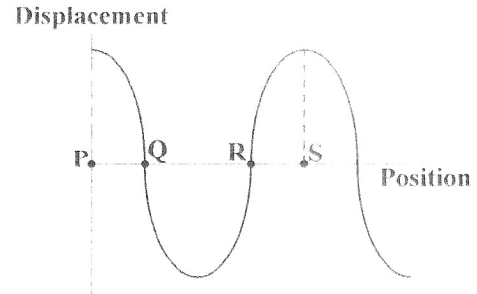
Item 25 refers to the following diagram which shows water boiling at the top of a glass test tube while a piece of ice wrapped in gauze remains unmelted at the bottom.



25. Which of the following is the reason for this occurrence?

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

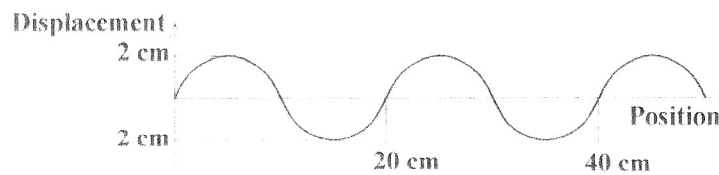
Item 26 refers to the following diagram which shows a transverse wave at a particular instant.



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

- (A) PQ
- (B) PR
- (C) PS
- (D) QR

Item 27 refers to the following diagram which shows the instantaneous profile of a wave travelling across a water surface.



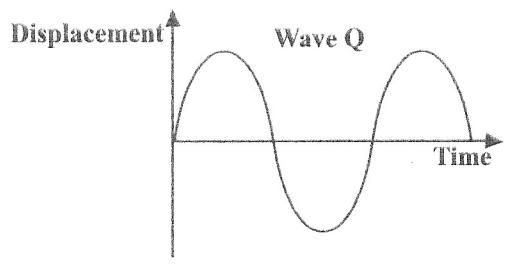
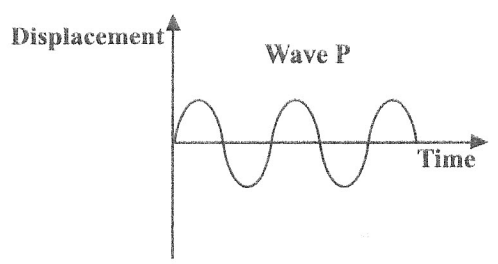
27. From the information above, the frequency is

- (A) $\frac{1}{20}$ Hz
- (B) 10 Hz
- (C) 20 Hz
- (D) unknown

28. An echo is quieter than the original sound that produced it. This shows that, compared to the original sound, the echo has a

- (A) smaller amplitude
- (B) shorter wavelength
- (C) lower frequency
- (D) slower speed

Item 29 refers to the following graphs (with axes having the same scales) of two sound waves, P and Q.



29. Based on the information above, which of the following statements is true?

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

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

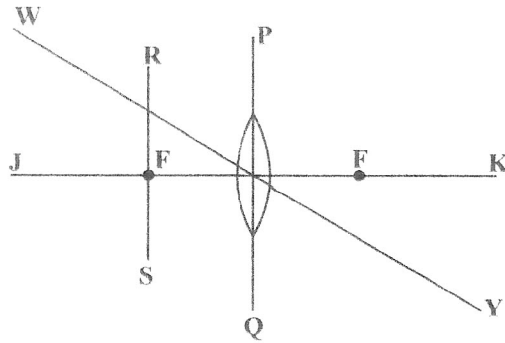
31. Boyle's law for a gas can be tested experimentally, provided which of the following are held constant?

- I. Temperature
 - II. Pressure
 - III. Mass
- (A) I and II only
 - (B) I and III only
 - (C) II and III only
 - (D) I, II and III

GO ON TO THE NEXT PAGE



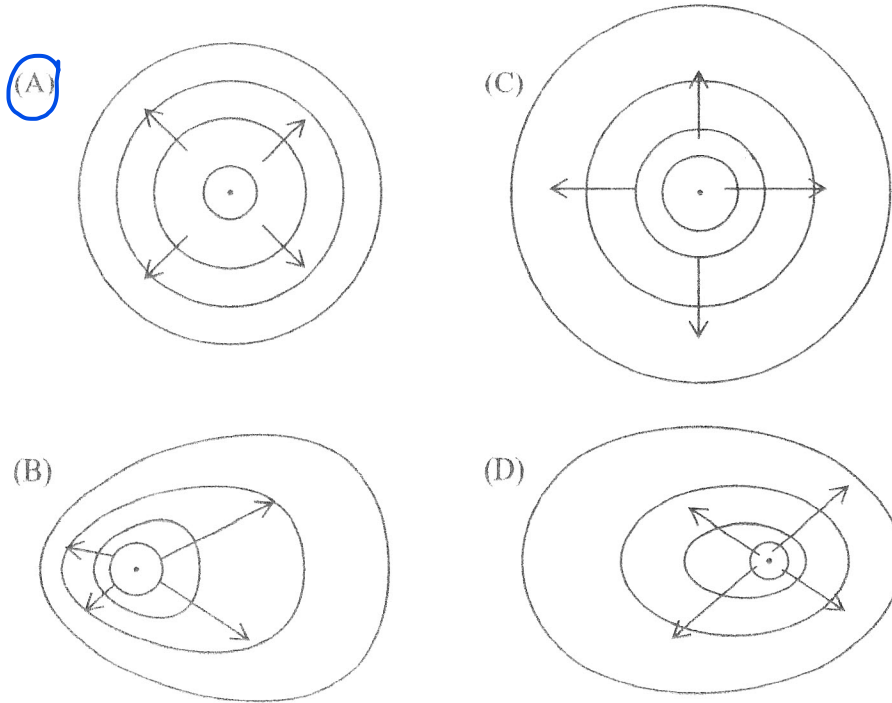
Item 32 refers to the following ray diagram of a converging lens.



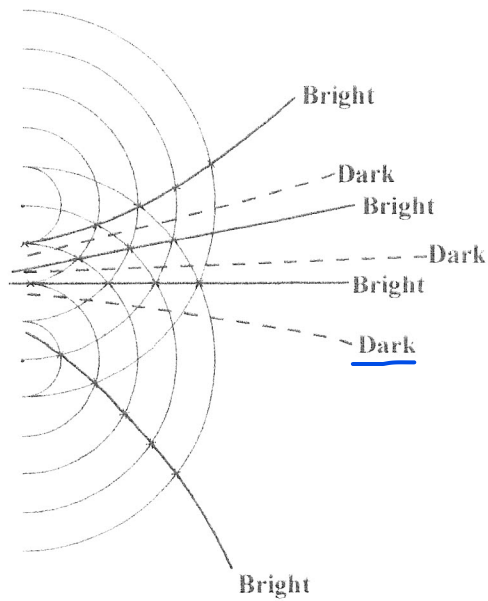
32. Which line lies along the principal axis of the converging lens?

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

33. Which of the following diagrams BEST represents the wave generated in a ripple tank by a small spherical dipper vibrating at a constant frequency?



Item 34 refers to the following diagram in which two coherent light sources produce an interference pattern on a screen of bright and dark fringes.

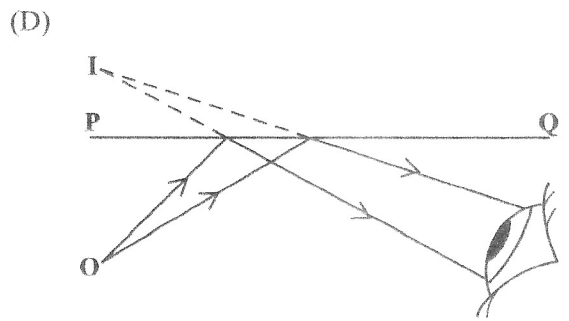
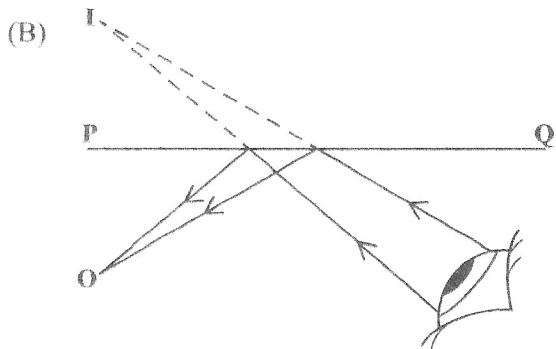
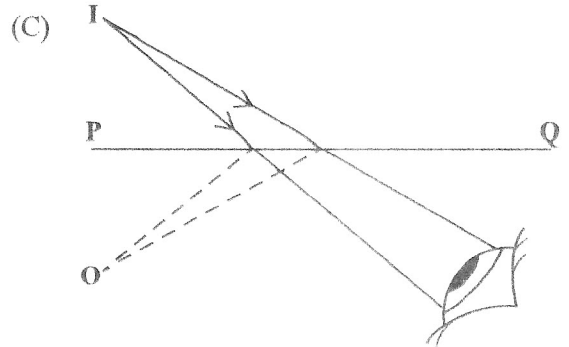
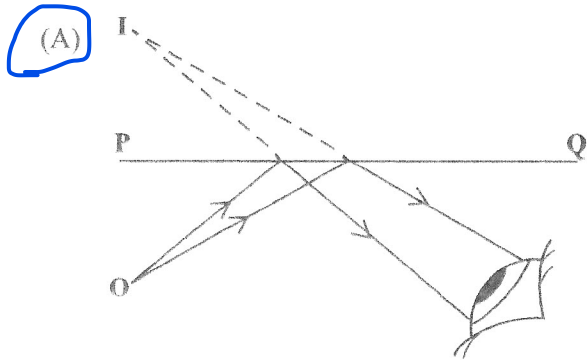


34. The reason for the formation of the bright fringes is that
- (A) these positions contain more light energy
 - (B) the crests are larger than the troughs along these lines
 - (C) all the crests and troughs are in phase along these points
 - (D) all the crests and troughs are out of phase along these points

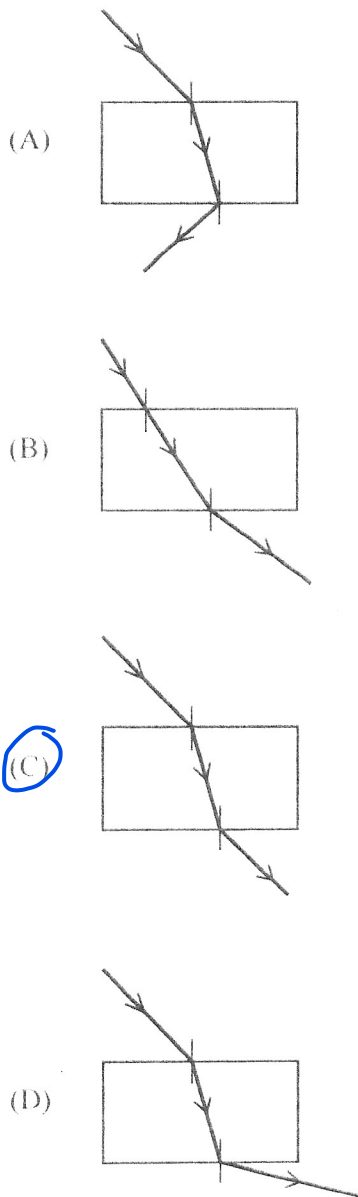
GO ON TO THE NEXT PAGE



35. An object O is viewed in a plane mirror PQ . Which of the following diagrams correctly shows the formation of the image?



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



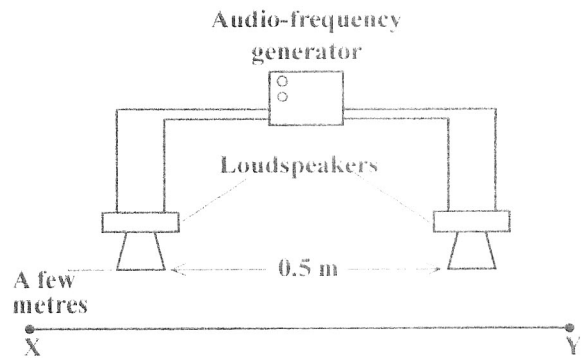
37. An explosion causes the emission of the following types of radiation.

- I. Light
- II. Sound
- III. Infra-red

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

Item 38 refers to the following diagram which shows two similar loudspeakers connected to the same audio-frequency generator. The speakers are set up a few metres away from a path, XY.



38. At some points along XY no sound is heard because

- (A) the sound waves are diffracted
- (B) the sound waves is refracted away from those points
- (C) interference of the sound waves takes place**
- (D) the sound waves are reflected back to the same source

GO ON TO THE NEXT PAGE

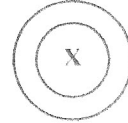


39. Magnetic induction occurs when
- (A) a magnet is suspended and points in the NS direction
 - (B) iron nails near a magnet become magnetized
 - (C) an N pole attracts an S pole
 - (D) an electroscope is charged

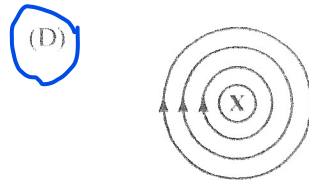
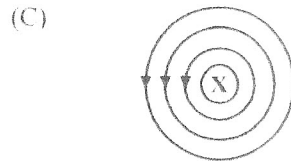
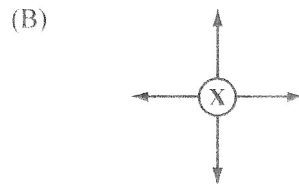
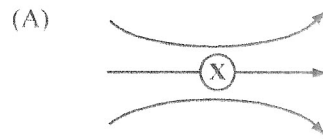
40. Rectification can BEST be done by using a

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

Item 41 refers to the following diagram which represents a straight wire carrying a current into the plane of a piece of paper.

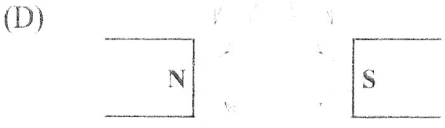
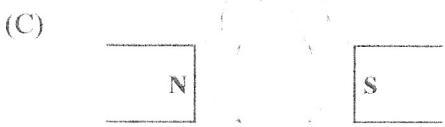
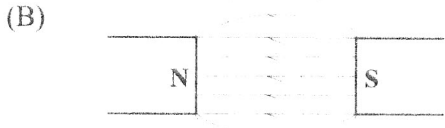
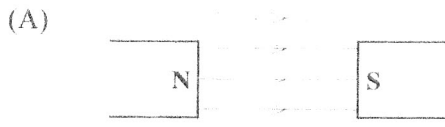


41. Which of the following diagrams BEST represents the magnetic field around the wire?



42.

Which of the following diagrams represents the magnetic field existing between two opposite magnetic poles?



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

(A) $P = I^2R$

(B) $P = VI$

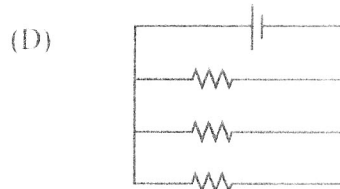
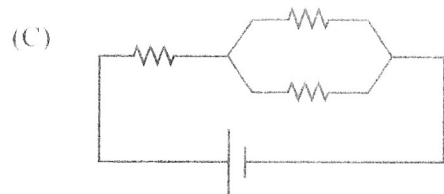
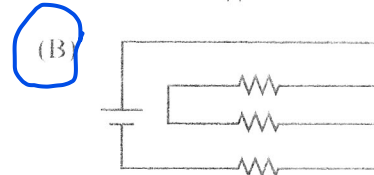
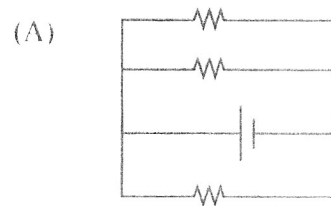
(C) $P = \frac{R}{V^2}$

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

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



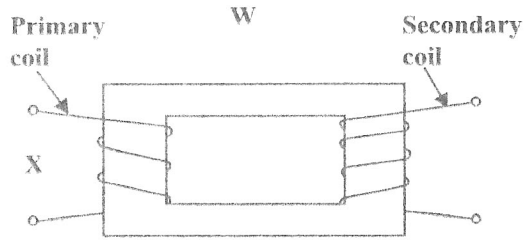
45. Which of the following circuit diagrams BEST represents a series arrangement?



GO ON TO THE NEXT PAGE



Item 46 refers to the following diagram.



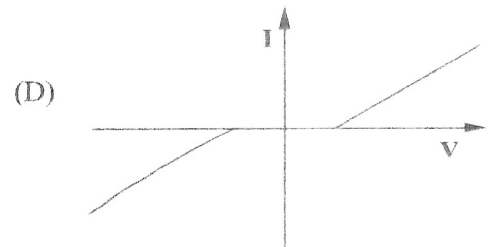
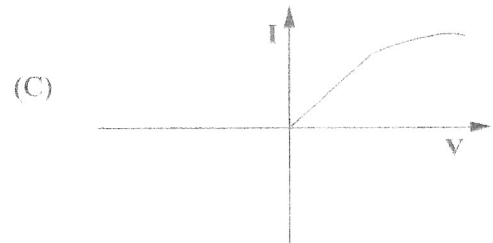
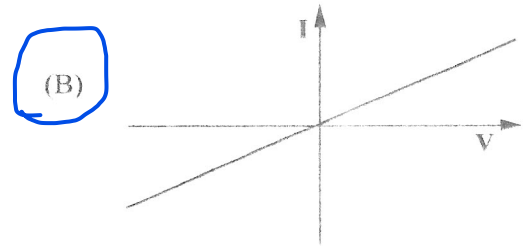
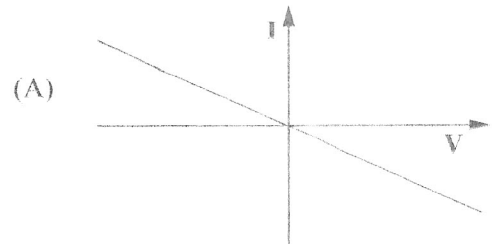
46. Appropriate labels for W and X are

	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

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

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

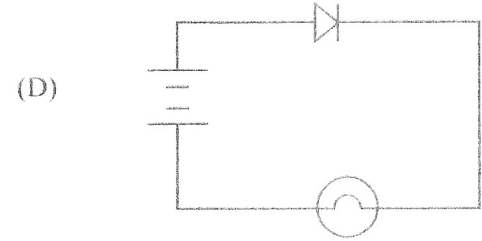
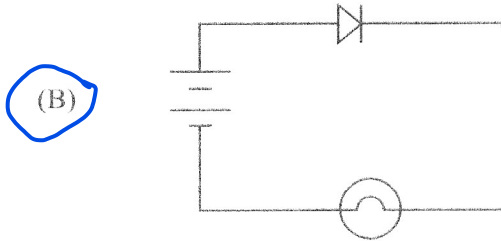
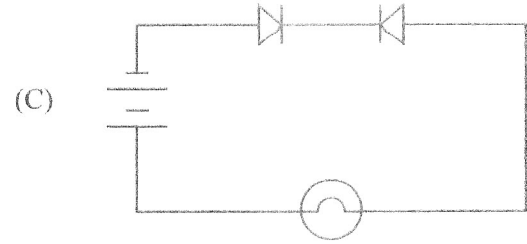
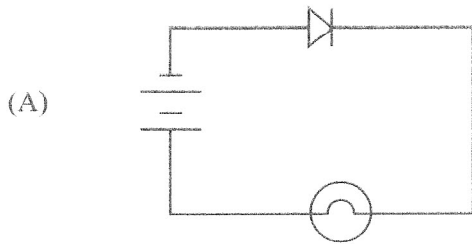
48. Which of the following diagrams is a representation of the current/p.d. relationship for a metallic conductor at a constant temperature?



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 $200\ \Omega$ 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

50. In which of the following circuits will the lamp light up?



51. Which of the following pairs of statements is true for BOTH iron and steel?

	Iron	Steel
(A)	Easily magnetized	Does not retain its magnetism
(B)	Not easily magnetized	Retains its magnetism well
(C)	Easily magnetized	Retains its magnetism well
(D)	Not easily magnetized	Does not retain its magnetism

GO ON TO THE NEXT PAGE



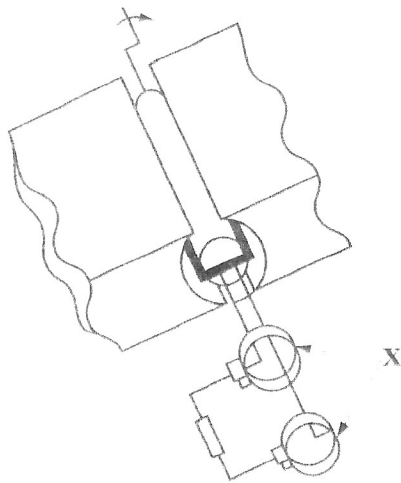
Item 52 refers to the following truth table with inputs A and B and output C.

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

52. Which of the following logic gates does the truth table above represent?

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

Item 53 refers to the following diagram of a simple a.c. generator.



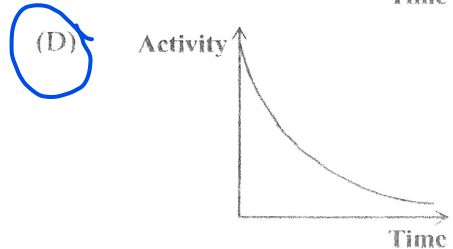
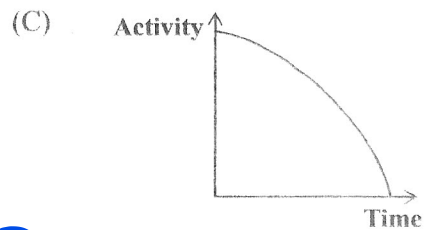
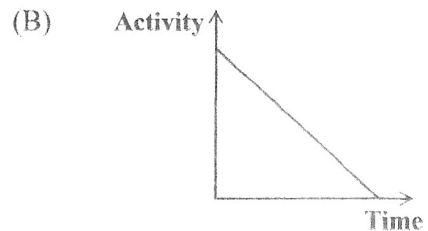
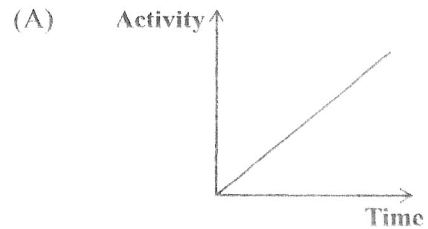
53. The parts labelled X in the diagram are known as the

- (A) coils
- (B) slip rings
- (C) armatures
- (D) commutators

54. 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

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



56. Which of the following are 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
57. The nuclide ${}_{90}^{234}\text{Th}$ 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 scientists formulated the equation $E = mc^2$?
- (A) Marie Curie
 - (B) Isaac Newton
 - (C) Albert Einstein
 - (D) J.J. Thompson
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. Which of the following equations is correct?
- (A) ${}_{88}^{226}\text{Ra} \rightarrow {}_{88}^{226}\text{Rn} + \beta\text{-particle}$
 - (B) ${}_{6}^{14}\text{C} \rightarrow {}_{7}^{14}\text{N} + \beta\text{-particle}$
 - (C) ${}_{88}^{226}\text{Ra} \rightarrow {}_{86}^{222}\text{Rn} + \alpha\text{-particle}$
 - (D) ${}_{6}^{14}\text{C} \rightarrow {}_{7}^{14}\text{N} + \alpha\text{-particle}$

END OF TEST

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





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 2019099

MAY/JUNE 2019

**CARIBBEAN EXAMINATIONS COUNCIL
 CARIBBEAN SECONDARY EDUCATION CERTIFICATE®
 EXAMINATION**

PHYSICS

Paper 01 – General Proficiency

1 hour 15 minutes

05 JUNE 2019 (p.m.)

READ THE FOLLOWING INSTRUCTIONS CAREFULLY.

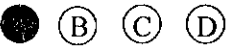
1. This test consists of 60 items. You will have 1 hour and 15 minutes to answer them.
2. In addition to this test booklet, you should have an answer sheet.
3. Each item in this test has four suggested answers lettered (A), (B), (C), (D). Read each item you are about to answer and decide which choice 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.

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.

212

A005



1. 3.1415926 expressed as TWO significant figures is
- (A) 3.1
 - (B) 3.14
 - (C) 3.2
 - (D) 31

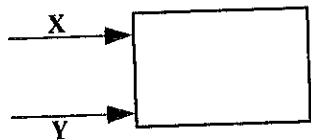
2. To measure the external diameter of a measuring cylinder most accurately, one should use a

- (A) metre rule
- (B) tape measure
- (C) length of string
- (D) pair of vernier calipers

3. 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 4 refers to the following diagram which shows two forces, X and Y, applied onto an object.



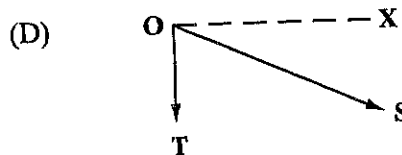
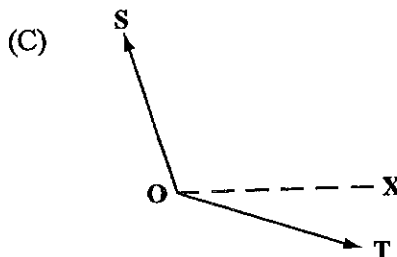
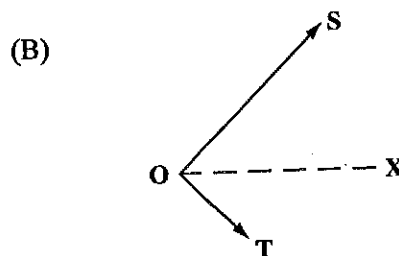
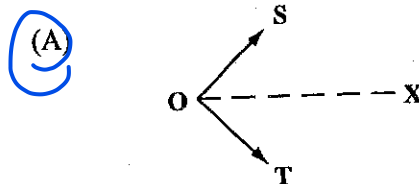
4. What should be the magnitude and direction of a third force which will cause the object to remain stationary?

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

5. A boy measured the height of a laboratory table with a metre rule. Which of the following is MOST likely to be correct?

- (A) 0.00895 m
- (B) 0.0895 m
- (C) 0.895 m
- (D) 8.95 m

6. The diagrams below, NOT drawn to scale, represent two forces, S and T, acting at O. In which of the following is the resultant in the direction OX?



7. When an astronaut is standing on the moon his mass is 70 kg. When he returns to earth his approximate weight will be

- (A) 70 kg
- (B) 420 kg
- (C) 70 N
- (D) 700 N

8. Which of the following rates will determine the power of a machine?

- I. Doing work
- II. Converting energy
- III. Changing temperature

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

9. Which of the following features must be present in a stable, well-designed racing car?

- (A) Sunroof
- (B) Long front
- (C) Narrow wheelbase
- (D) Low centre of gravity

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

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

11. Pressure in a liquid can be calculated using the formula

$$P = \rho gh.$$

Which of the following sets of units will result in the SI unit of pressure?

	ρ	g	h
(A)	g cm^{-3}	m s^{-2}	mm
(B)	kg m^{-3}	N kg^{-1}	m
(C)	g cm^{-3}	N kg^{-1}	m
(D)	kg m^{-3}	cm s^{-2}	cm

12. Which of the following is the unit of momentum?

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

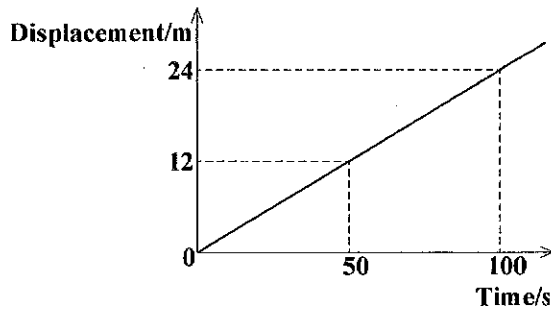
13. Which of the following quantities has the same value as $6 \mu\text{C}$?

- (A) $6 \times 10^6 \text{ C}$
- (B) $6 \times 10^3 \text{ C}$
- (C) $6 \times 10^{-3} \text{ C}$
- (D) $6 \times 10^{-6} \text{ C}$

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

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

Item 15 refers to the following graph which shows how the displacement of a runner from a starting line varies with time.



15. From the graph it can be deduced that the runner is

- (A) going slower and slower
- (B) going at a steady speed
- (C) going faster and faster
- (D) not moving

16. An object is removed from the ground and placed on a shelf. Which of its properties is expected to increase?

- (A) Mass
- (B) Volume
- (C) Potential energy
- (D) Kinetic energy

17. Which of the following is the POOREST conductor of thermal energy?

- (A) Air
- (B) Copper
- (C) Mercury
- (D) Aluminium

18. Boyle's law for a gas can be tested experimentally, provided which of the following remain constant?

- I. Temperature
- II. Pressure
- III. Mass

- (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 are characteristic features of a clinical thermometer?

- I. Narrow constriction in the tube just above the bulb
- II. Limited range of temperatures
- III. Large bore to make the mercury more visible

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

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

212

A005

21. The specific latent heat of vaporization of water is $2.26 \times 10^6 \text{ J kg}^{-1}$. When 0.01 kg of water is converted into steam it

- (A) absorbs $2.26 \times 10^4 \text{ J}$
- (B) gives out $2.26 \times 10^4 \text{ J}$
- (C) absorbs $2.26 \times 10^8 \text{ J}$
- (D) gives out $2.26 \times 10^8 \text{ J}$

22. A gas occupies 2 m^3 at 27°C at a pressure of 1 atmosphere. At a pressure of 2 atmospheres it occupies a volume of 1 m^3 . What is its temperature at this new volume and pressure?

- (A) 54.0°C
- (B) 27.0°C
- (C) 6.75°C
- (D) -198°C

$$\frac{2 \times 1}{300} = \frac{1 \times T}{T}$$

23. Which of the following statements concerning the radiation of heat is/are true?

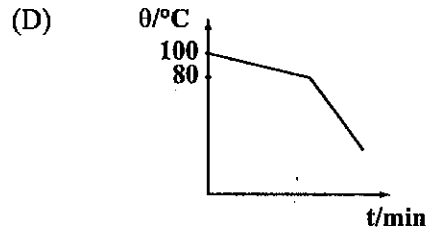
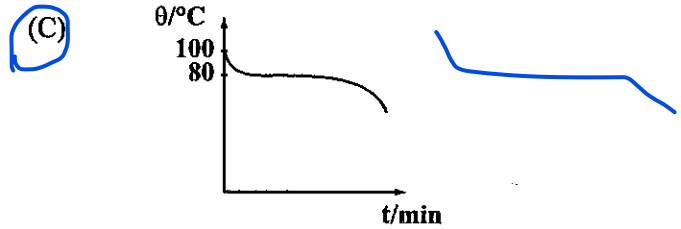
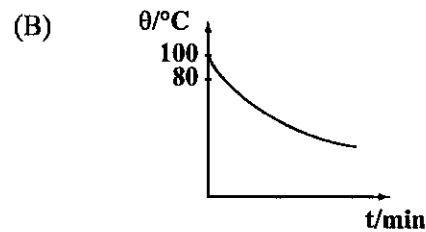
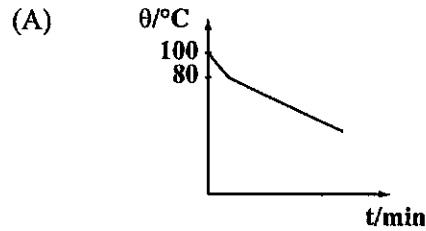
- I. Radiation can only take place in a material medium.
- II. A good absorber is also a good emitter of radiation.
- III. Dark dull surfaces are better emitters than shiny ones.

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

24. Which of the following quantities remain unchanged with an INCREASE in temperature?

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

25. Some molten naphthalene at 100°C is allowed to cool to room temperature. If naphthalene has a melting point of 80°C , which of the following graphs BEST represents the cooling curve?



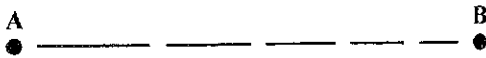
26. An electric kettle full of water is plugged into the mains. The MAJOR process by which heat travels through the water is

- (A) radiation
- (B) convection
- (C) conduction
- (D) electrification

212

A005

Item 27 refers to the following diagram.



27. In using a slinky to demonstrate longitudinal waves moving from Point A to Point B above, the spring is made to vibrate

- (A) parallel to AB
- (B) perpendicular to AB
- (C) at an obtuse angle to AB
- (D) at an acute angle to AB

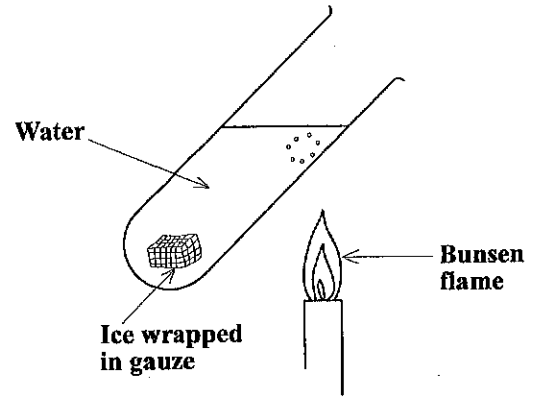
28. In which of the following is conduction the MAIN method of energy transfer?

- (A) Food heated in a microwave oven
- (B) Energy transferred from the sun to earth
- (C) Food being cooked on a barbecue
- (D) Food being cooked in a pot on an electric stove

29. Which of the following statements does NOT provide evidence that sound waves can be reflected?

- (A) Sound can be heard around a corner in open air.
- (B) Speaking tubes can be used for passing messages in ships.
- (C) The depth of the ocean can be measured using ultrasound.
- (D) Echoes can be heard when a person shouts in a large empty room.

Item 30 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.



30. Which of the following statements is the reason for this occurrence?

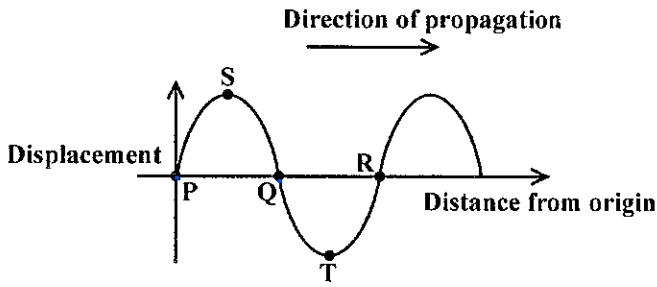
- (A) Water is a poor conductor of heat.
- (B) Gauze is a poor conductor of heat.
- (C) Water is a good conductor of heat.
- (D) Glass is a good conductor of heat.

31. Whenever there is complete destructive interference between two coherent wave trains, the waves must be

- (A) in phase
- (B) out of phase by half of a wavelength
- (C) out of phase by one wavelength
- (D) out of phase by a quarter of a wavelength

GO ON TO THE NEXT PAGE

Item 32 refers to the following diagram of a wave.



32. Which of the following statements about the wave shown in the diagram are true?

- I. Points P, Q and R are in phase.
- II. Points S and T are out of phase.
- III. The wavelength of the wave is the distance PR.

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

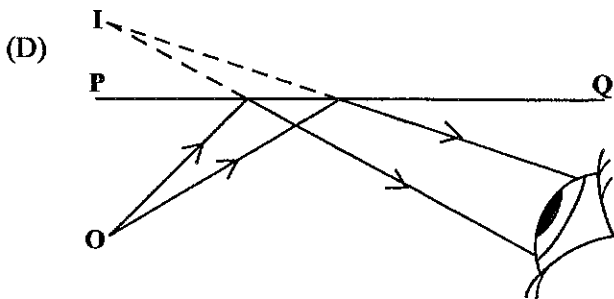
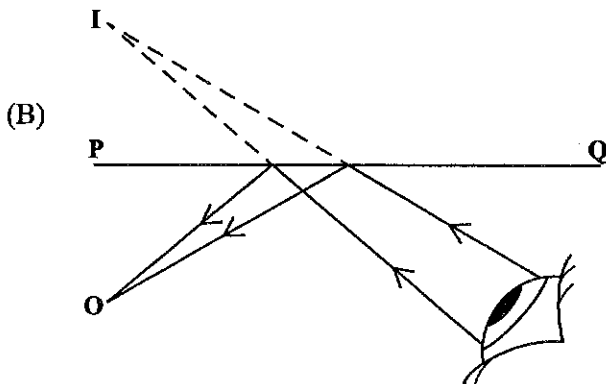
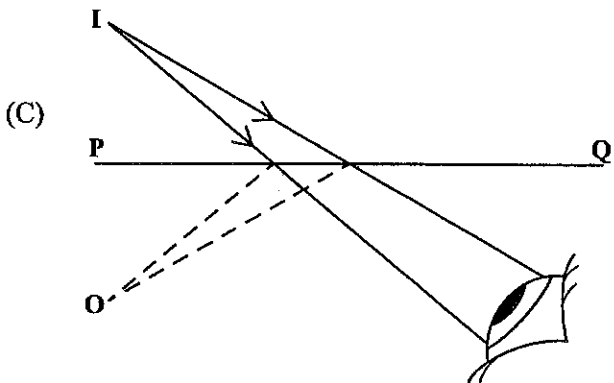
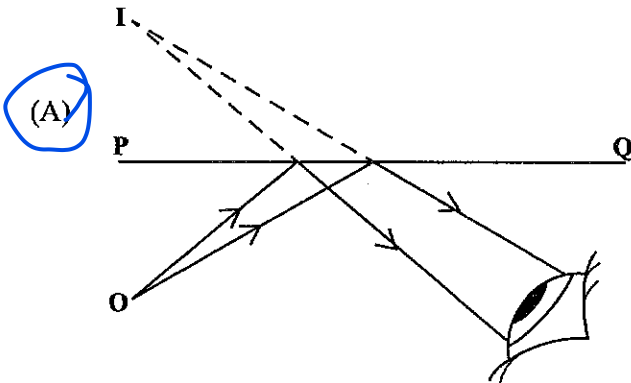
33. An echo is quieter than the original sound that produced it. This shows that, compared to the original sound, the echo has a

- (A) smaller amplitude
- (B) shorter wavelength
- (C) lower frequency
- (D) slower speed

34. Which of the following can produce a diminished virtual image of a real object?

- (A) A converging lens
- (B) A diverging lens
- (C) A plane mirror
- (D) A glass block

35. An object O is viewed in a plane mirror PQ. Which of the following diagrams correctly shows the formation of the image?

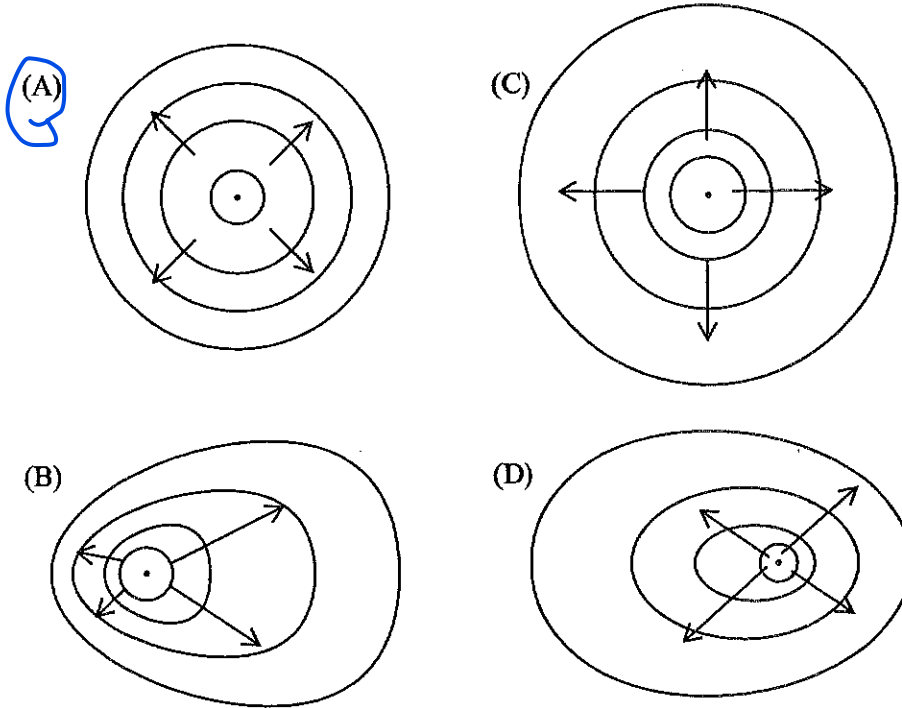


GO ON TO THE NEXT PAGE

212

A005

36. Which of the following diagrams BEST represents the wave generated in a ripple tank by a small spherical dipper vibrating at a constant frequency?



212

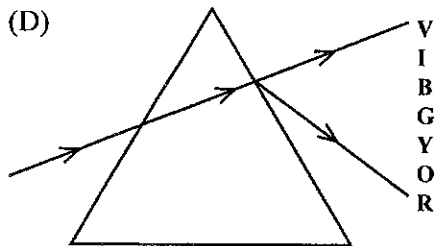
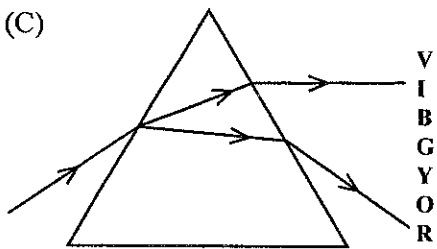
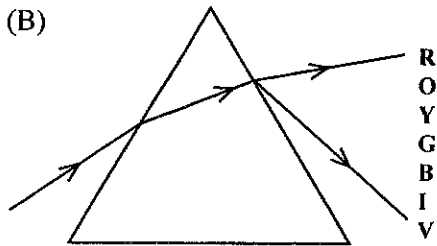
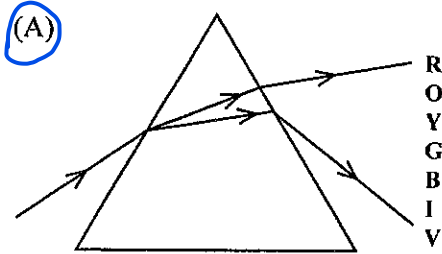
37. Which of the following statements about waves is true?

- (A) Only transverse waves undergo reflection.
- (B) Diffraction can only take place with light waves.
- (C) All waves undergo reflection, refraction and diffraction.
- (D) Longitudinal waves do not undergo refraction, but may be reflected.

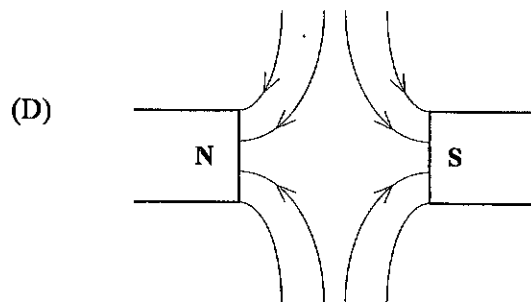
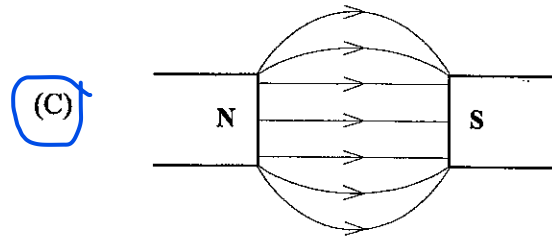
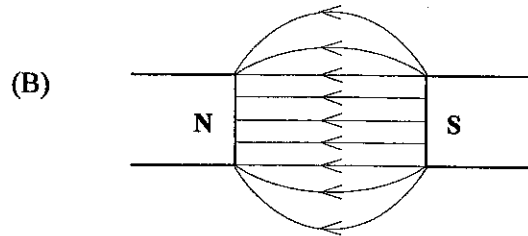
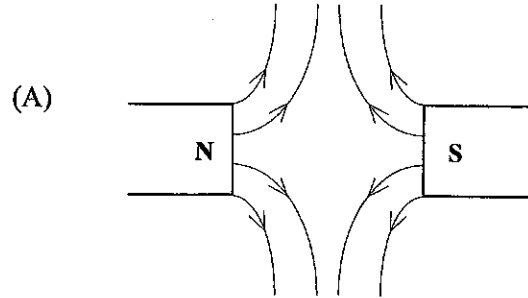
A005

GO ON TO THE NEXT PAGE

38. A ray of white light enters a transparent glass prism. In which of the following diagrams is the dispersion of light correctly illustrated?



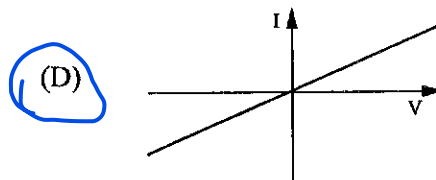
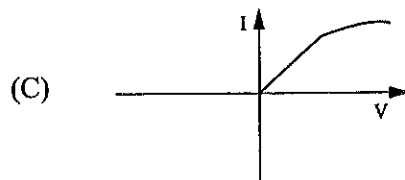
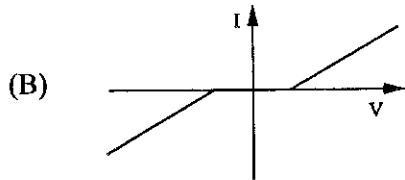
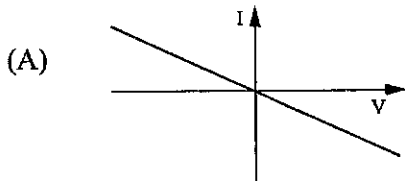
39. Which of the following diagrams represents the magnetic field which exists between two opposite magnetic poles?



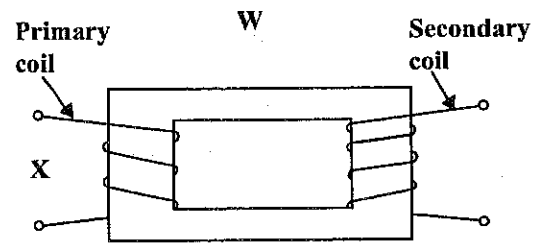
212

A005

40. Which of the following diagrams is a graphical representation of current versus potential difference for a metallic conductor at a constant temperature?



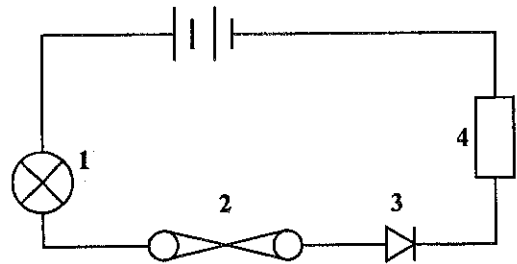
Item 41 refers to the following diagram.



41. Appropriate labels for W and 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 |

Item 42 refers to the following diagram.



42. Which of the following options shows the correct match of the component name and its number?

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

GO ON TO THE NEXT PAGE

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

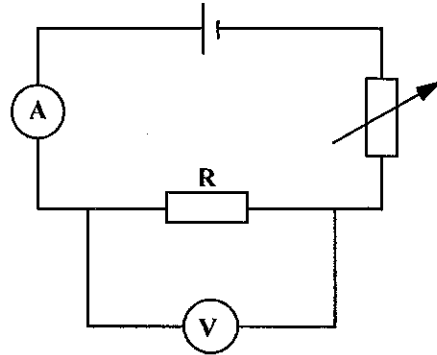
Item 44 refers to the following truth table with inputs A and B and output C.

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

44. Which of the following logic gates does the truth table above describe?

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

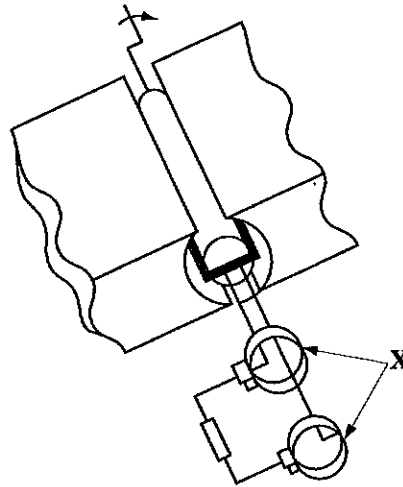
Item 45 refers to the following circuit where the ammeter reads 0.4 A and the voltmeter reads 0.6 V.



45. What is the resistance of R?

- (A) 15 Ω
- (B) 1.5 Ω
- (C) 0.67 Ω
- (D) 0.24 Ω

Item 46 refers to the following diagram of a simple a.c. generator.



46. The parts labelled X in the diagram are known as the

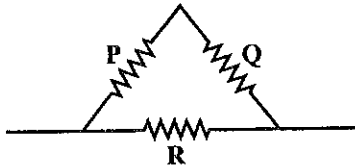
- (A) commutators
- (B) armatures
- (C) slip rings
- (D) coils

47. Which of the following statements about alternating current is true?

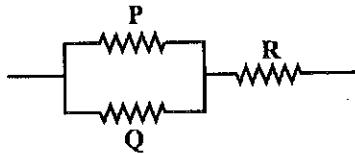
- (A) It can be changed into direct current by a transformer.
- (B)** It can be rectified by using a semiconductor diode.
- (C) It can be used to recharge a battery.
- (D) It is used to transmit electrical energy because of its high frequency.

48. In which of the following diagrams are resistors P and Q in series with each other and parallel with R?

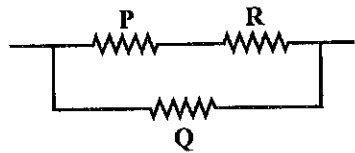
(A)



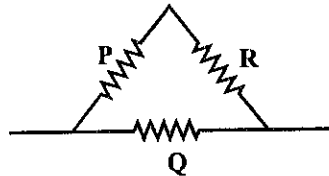
(B)



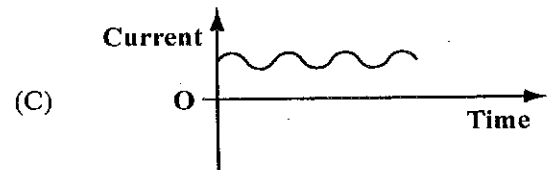
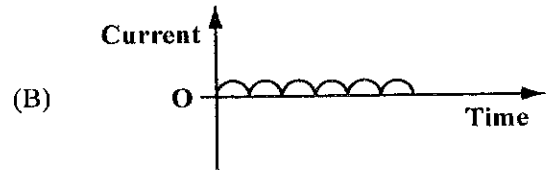
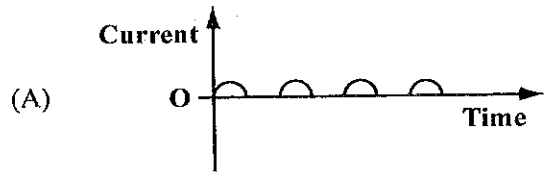
(C)



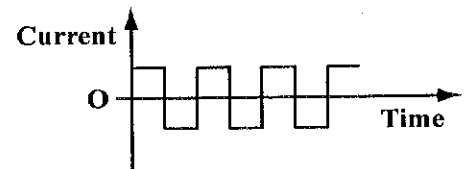
(D)



49. Which of the following graphs illustrates an ALTERNATING current?



(D)



50. Magnetic induction occurs when

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

212

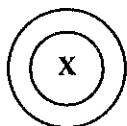
A005

51. Which of the following pairs of statements is true for BOTH iron and steel?

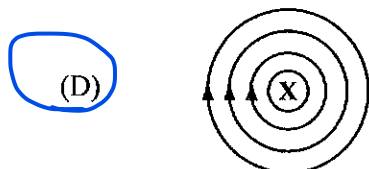
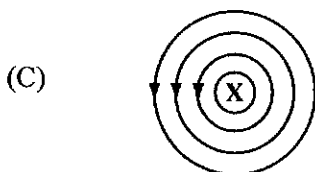
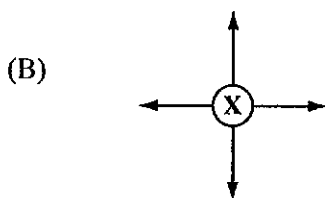
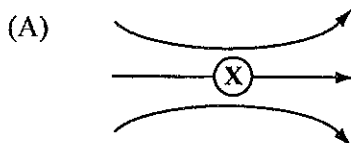
	Iron	Steel
(A)	Easily magnetized	Does not retain its magnetism
(B)	Not easily magnetized	Retains its magnetism well
(C)	Easily magnetized	Retains its magnetism well
(D)	Not easily magnetized	Does not retain its magnetism

2020

Item 52 refers to the following diagram which represents a straight wire carrying a current into the plane of the paper.



52. Which of the following diagrams BEST represents the magnetic field around the wire?



53. Which of the following are possible symbols for an isotope of the nuclide ${}^A_Z X$?

I. ${}^{A-2}_Z X$

II. ${}^A_{Z-2} X$

III. ${}^{A+2}_Z X$

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

54. ${}^{14}_6 C$ (Carbon-14) decays in accordance with the equation ${}^{14}_6 C \rightarrow {}^{14}_7 N + X$. The emission X is

- (A) a proton
 (B) a gamma ray
(C) a beta particle
 (D) an alpha particle

${}^0_{-1}e$

212

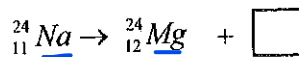
A005

55. In the equation $\Delta E = \Delta mc^2$
- (A) c = speed of light, Δm = mass of atom
 - (B) c = speed of light, Δm = mass lost
 - (C) c = specific heat capacity of substance, Δm = mass lost
 - (D) c = specific heat capacity of substance, Δm = mass of substance

56. The number of neutrons present in the nucleus of the nuclide ${}^{222}_{86}\text{Rn}$ is
- (A) 308
 - (B) 222
 - (C) 136
 - (D) 86

57. 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

58. Sodium-24 decays into Magnesium-24 with the emission of a β -particle and can be represented by the following equation.



Which of the following options should be placed in the box to complete the equation?

- (A) ${}^0_1\text{e}$
- (B) ${}^0_{-1}\text{e}$
- (C) ${}^4_2\text{He}$
- (D) ${}^4_{-2}\text{He}$

59. Which of the following scientists discovered the relationship $E = mc^2$?

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

R = 2020

60. A radioactive isotope has a half-life of 20 days. How many days will it take for a given sample to have its activity reduced to $\frac{1}{8}$ of its initial value?

- (A) 1.2 days
- (B) 60 days
- (C) 80 days
- (D) 320 days

END OF TEST

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



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**

MAY/JUNE 2018

FORM TP 2018096

**CARIBBEAN EXAMINATIONS COUNCIL
CARIBBEAN SECONDARY EDUCATION CERTIFICATE®
EXAMINATION**

PHYSICS

Paper 01 – General Proficiency

1 hour 15 minutes

06 JUNE 2018 (p.m.)

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.

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.

1. Errors due to parallax can be minimized by

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

2. Which of the following measuring instruments is MOST suitable for accurately measuring the volume of 40.2 cm^3 of a liquid?

- (A) Burette
- (B) Pipette
- (C) Beaker
- (D) Measuring cylinder

3. Which of the following changes can be caused by a force acting on a body?

- I. Shape
- II. Motion
- III. Density

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

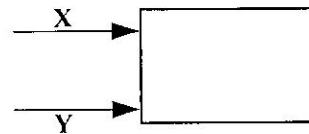
4. The mass of an astronaut is 70 kg when standing on the moon. When he returns to Earth, his approximate weight will be

- (A) 70 kg
- (B) 70 N
- (C) 420 kg
- (D) 700 N

5. 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) product of the force and its perpendicular distance from the turning point to the force
- (D) ratio of the force and its perpendicular distance from the turning point

Item 6 refers to the following diagram which shows two forces, X and Y, applied to an object.



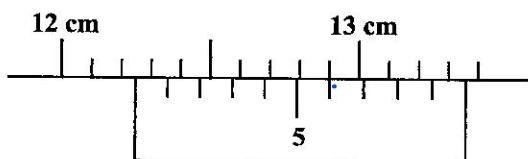
6. What should be the magnitude and direction of a third force which will cause the object to remain stationary?

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

7. When a force, F , is applied to a spring of original length, L , the new length becomes $L + x$. What would be the length of the spring if a force of $\frac{F}{2}$ is applied instead?

- (A) $L + 2x$
- (B) $2(L + x)$
- (C) $L + x$
- (D) $L + \frac{x}{2}$

Item 8 refers to the following diagram of a vernier caliper.



8. Which of the following readings is shown on the scale above?

- (A) 12.06 cm
- (B) 12.26 cm
- (C) 12.25 cm
- (D) 12.29 cm

9. Which of the following measures may be classified as scalar quantities?

- I. Time
- II. Speed
- III. Displacement

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

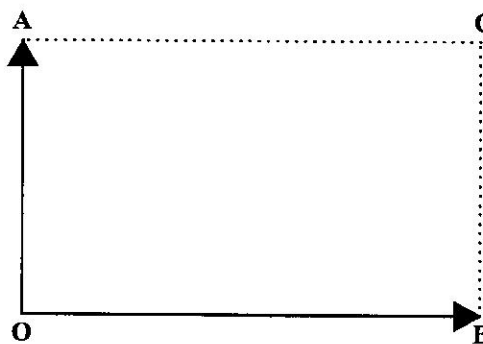
10. Pressure in a liquid can be calculated using the formula

$$P = \rho gh.$$

Which of the following sets of units will result in the SI unit of pressure?

	ρ	g	h
(A)	g cm^{-3}	m s^{-2}	mm
(B)	g cm^{-3}	N kg^{-1}	m
(C)	kg m^{-3}	cm s^{-2}	cm
<input checked="" type="radio"/> (D)	kg m^{-3}	N kg^{-1}	m

Item 11 refers to the following diagram which shows two vectors of magnitudes a and b represented respectively by \overline{OA} and \overline{OB} .



11. The vectors act at point O and are directed perpendicular to each other. Which of the following pairs represents BOTH the magnitude and direction of their resultant?

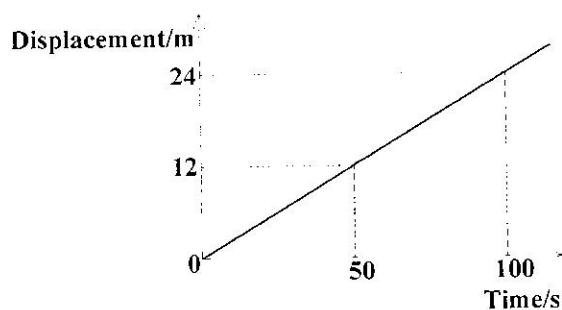
Magnitude Direction

- (A) $a^2 + b^2$ \overline{OC}
- (B) $a + b$ \overline{CO}
- (C) $\sqrt{(a^2 + b^2)}$ \overline{CO}
- (D) $\sqrt{(a^2 + b^2)}$ \overline{OC}

12. The acceleration due to gravity (g) is to be determined by measuring the time (t) taken for a small steel ball to fall through a specific height. Which of the following activities is UNNECESSARY?

- (A) Find the mass of the ball.
- (B) Allow the ball to drop and start the stopwatch at the same instant.
- (C) Measure the height through which the ball falls.
- (D) Repeat the time measurements and take the average.

Item 13 refers to the following graph which shows how the displacement of a runner from a starting line varies with time.



13. From the graph it can be deduced that the runner is

- (A) not moving
- (B) going at a steady speed
- (C) going faster and faster
- (D) going slower and slower

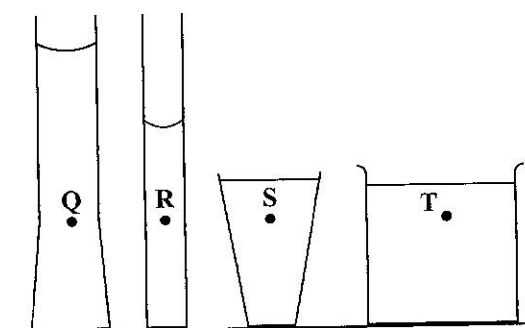
14. The time period of a simple pendulum oscillating with a small amplitude depends on the

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

15. An object is removed from the ground and placed on a shelf. Which of the object's properties is expected to increase?

- (A) Mass
- (B) Volume
- (C) Potential energy
- (D) Kinetic energy

Item 16 refers to the following diagrams of four vessels, filled with water.



16. The pressure due to the water is the GREATEST at

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

17. A bubble of gas rises to the surface of a soft drink. This is because the

- (A) density of the gas is greater than the density of the drink
- (B) upthrust on the bubble is greater than the weight of the bubble
- (C) upthrust on the bubble is greater than the weight of water it displaces
- (D) weight of the water displaced by the bubble is less than the weight of the bubble

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 statements concerning the radiation of heat is/are true?

- I. Radiation can only take place in a material medium.
- II. A good absorber of radiation is also a good emitter of radiation.
- III. Dark, dull surfaces are better emitters than shiny ones.

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

20. An electric kettle full of water is plugged into the mains. The process by which heat travels through the water is known as

- (A) radiation
- (B) convection
- (C) evaporation
- (D) electrification

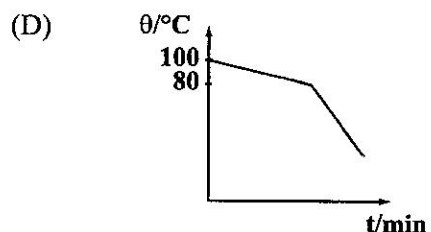
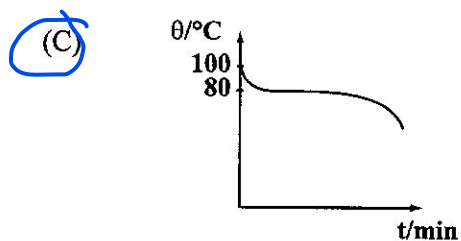
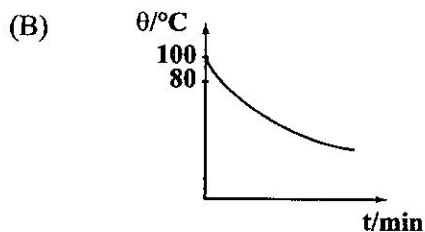
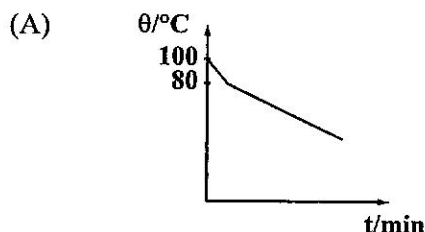
21. The energy required to change the state of a substance was determined to be E_H . If the mass of the substance is DOUBLED, the value of E_H will

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

22. Which of the following statements about evaporation is FALSE?

- (A) Evaporation occurs at room temperature only.
- (B) Evaporation requires heat energy and causes cooling.
- (C) Evaporation occurs only at the surface.
- (D) In evaporation the faster molecules escape the liquid.

23. Some molten naphthalene at 100 °C is allowed to cool to room temperature. If naphthalene has a melting point of 80 °C, which of the following graphs BEST represents the cooling curve of naphthalene?



24. 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

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

26. When heating a substance, a point is reached where no further change in temperature is observed. The MOST likely reason for this is that the

- (A) heater is supplying less heat
- (B) substance is changing state
- (C) substance needs to be stirred less frequently
- (D) substance is losing heat to the atmosphere

27. Which of the following phenomena are exhibited by sound waves?

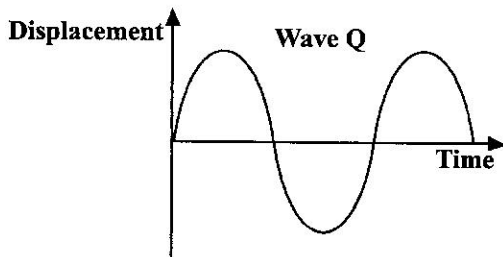
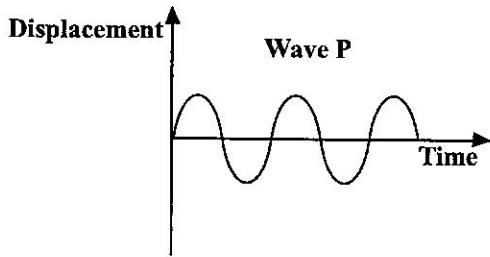
- I. Refraction
- II. Diffraction
- III. Interference

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

28. Whenever there is complete destructive interference between two coherent wave trains, the waves must be

- (A) in phase
- (B) out of phase by half of a wavelength
- (C) out of phase by one wavelength
- (D) out of phase by a quarter of a wavelength

Item 29 refers to the following graphs (with axes having the same scales) of two sound waves, P and Q.

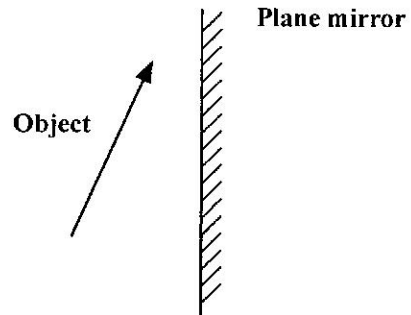


29. Which of the following statements is true?
- (A) P is louder than Q but Q has a higher pitch.
 - (B) P is louder than Q and also has a higher pitch than Q.
 - (C) Q is louder than P but P has a higher pitch.
 - (D) Q is louder than P and also has a higher pitch than P.

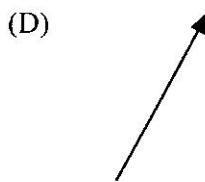
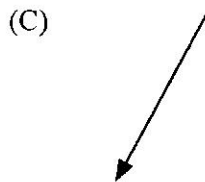
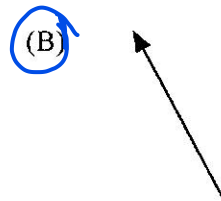
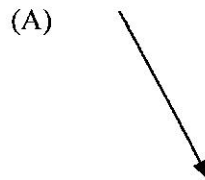
30. Which of the following equations expresses the correct relationship between the wavelength, λ , speed, v , and frequency, f , of a wave?

- (A) $f = \frac{v}{\lambda}$
- (B) $f = \frac{\lambda}{v}$
- (C) $\lambda = fv$
- (D) $\lambda = \frac{f}{v}$

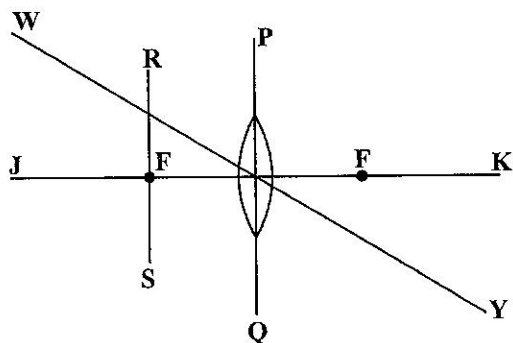
Item 31 refers to the following diagram which shows an object in front of a plane mirror.



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



Item 32 refers the following diagram.

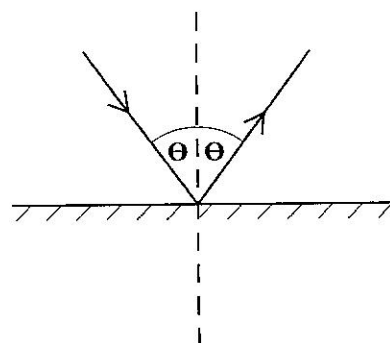


32. Which line lies along the principal axis of the converging lens?

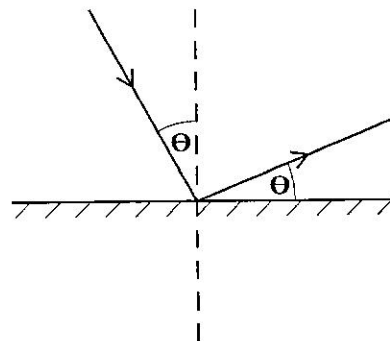
- (A) JK
- (B) PQ
- (C) RS
- (D) WY

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

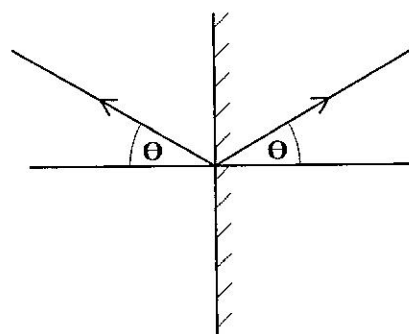
(A)



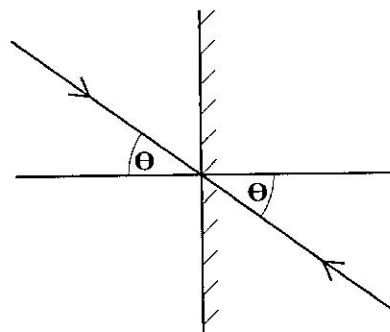
(B)



(C)



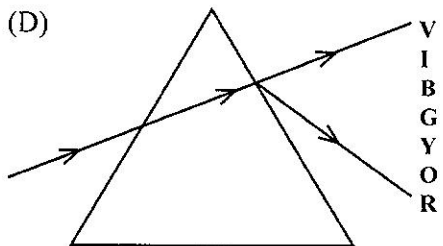
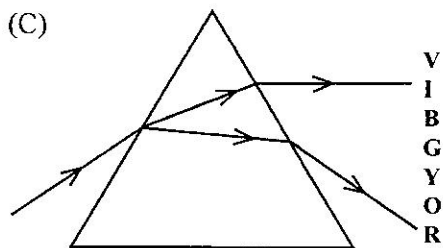
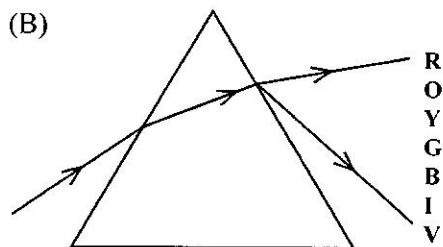
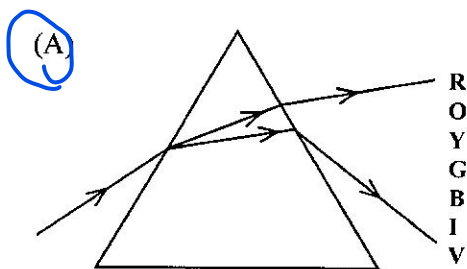
(D)



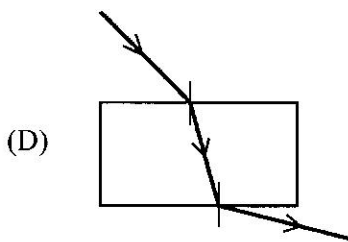
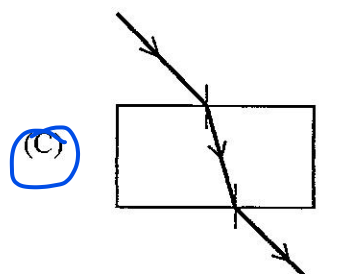
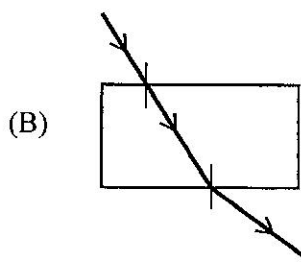
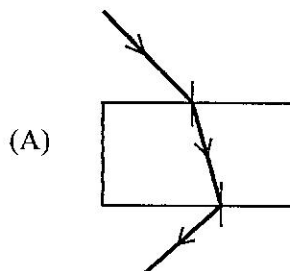
34. Which of the following types of electromagnetic radiation causes tanning?

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

35. A ray of white light enters a transparent glass prism. In which of the following diagrams is the dispersion of light correctly illustrated?



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



37. A ray of light leaves the air and enters glass of refractive index 1.5. If the angle of incidence is 37° , what is the sine of the angle of refraction?

(A) $1.5 \sin 37^\circ$

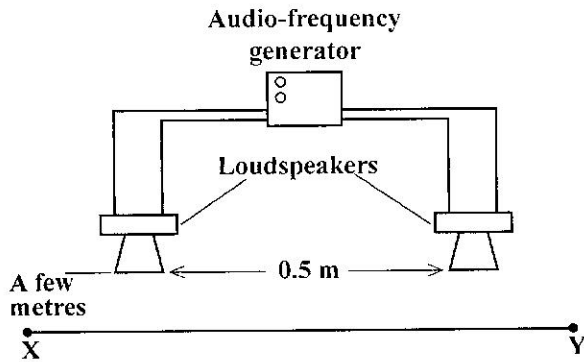
(B) $1.5 + \sin 37^\circ$

(C) $\frac{1.5}{\sin 37^\circ}$

(D) $\frac{\sin 37^\circ}{1.5}$

Handwritten notes:
 $\frac{\sin 37}{1.5}$
 $n_1 \sin i = n_2 \sin r$
 $1 \sin 37 = 1.5 \sin r$

Item 38 refers to the following diagram. Two similar loudspeakers are connected to the same audio-frequency generator and set up as shown.



38. At some points along XY, no sound is heard because

(A) the sound waves are diffracted

(B) sound is refracted away from those points

(C) interference of the sound waves takes place

(D) the sound waves are reflected back to the same source

39. The human ear is incapable of hearing a silent dog whistle because

(A) it does not make a noise

(B) the speed of sound is too fast to be detected by the human ear

(C) the frequency of the waves are above the range detected by the human ear

(D) the waves are infrasound with frequencies below that detectable by the human ear

40. Which of the following electromagnetic waves has the SHORTEST wavelength?

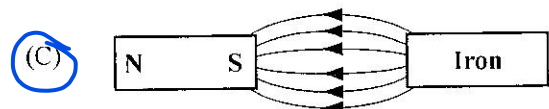
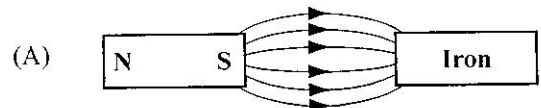
(A) Gamma rays

(B) Infrared waves

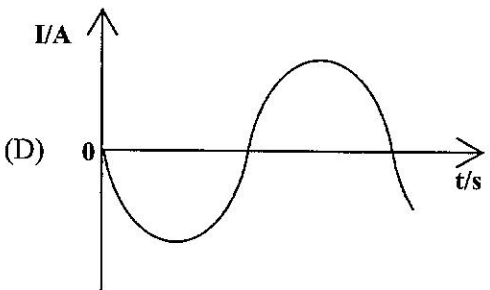
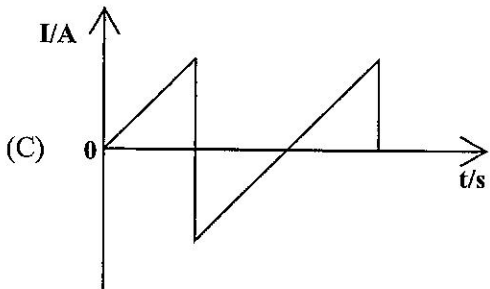
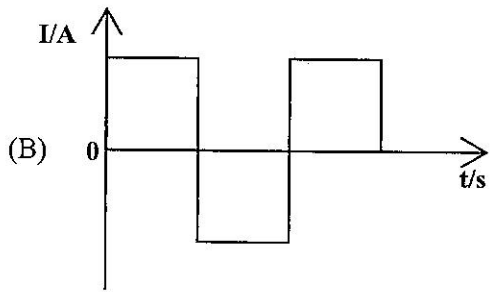
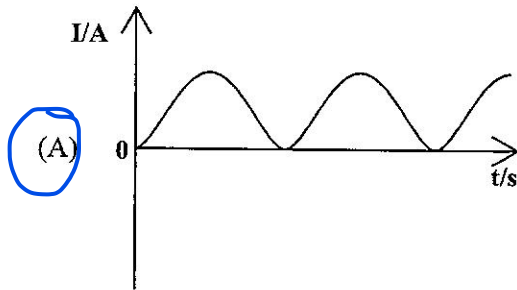
(C) Radio waves

(D) Ultraviolet radiation

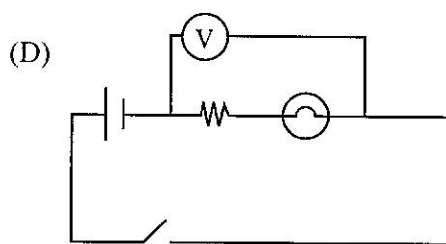
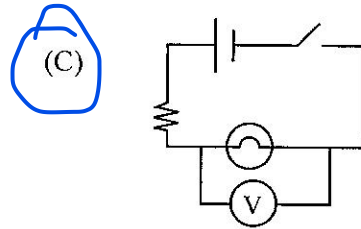
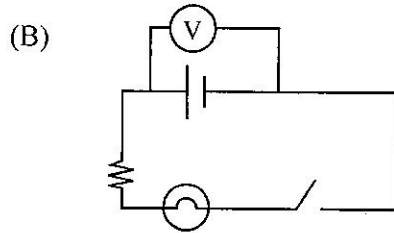
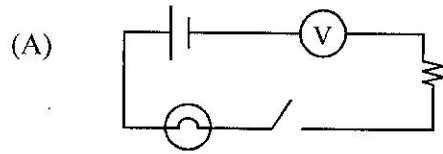
41. Which of the following diagrams shows the magnetic field formed between a bar magnet and a piece of iron?



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



43. Which of the following circuit arrangements is BEST suited for measuring a lamp's voltage?

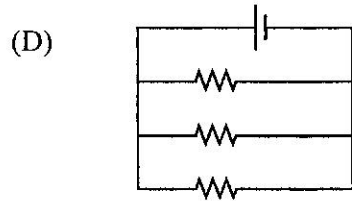
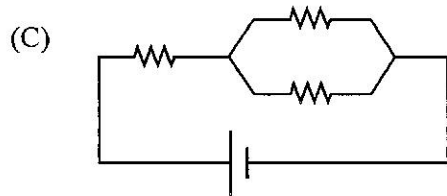
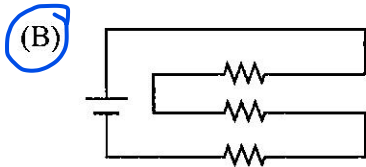
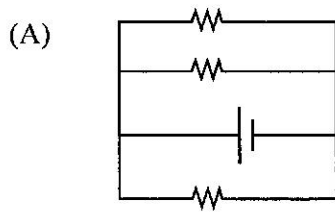


44. The unit of potential difference is defined as one

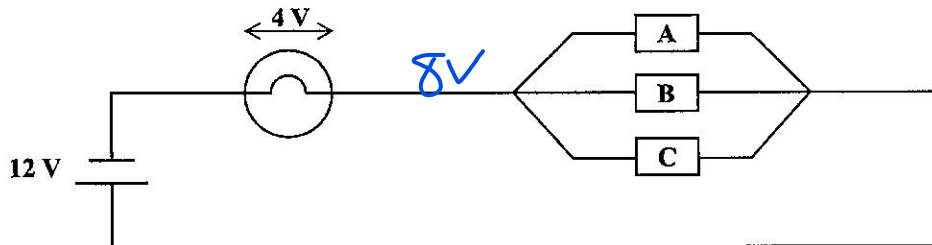
- (A) joule per volt
- (B) volt per ampere
- (C) joule per ampere
- (D) joule per coulomb

$$V = \frac{E}{Q}$$

45. Which of the following circuit diagrams BEST represents a series arrangement?



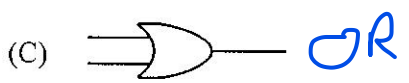
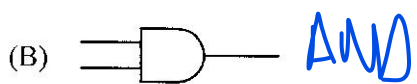
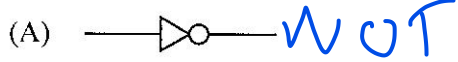
Item 46 refers to the following diagram



46. Given that the potential difference across the lamp in the circuit is 4 V, what is the potential difference across resistor A?

- (A) $(12 \div 4) \text{ V}$
- (B) $(12 \times 4) \text{ V}$
- (C) $(12 - 4) \text{ V}$
- (D) $(12 + 4) \text{ V}$

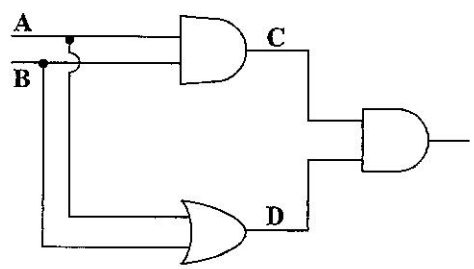
47. Which symbol represents the NAND gate?



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

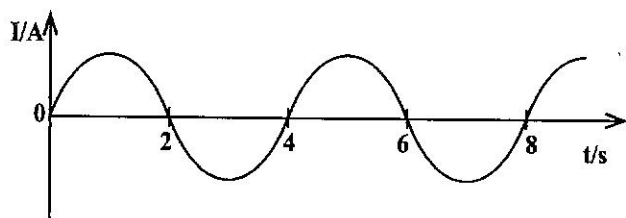
Item 48 refers to the following diagram.



48. What is the output at C and D when the input at A is 0 and input at B is 1.

	C	D
(A)	0	0
<input checked="" type="radio"/> (B)	0	1
(C)	1	0
(D)	1	1

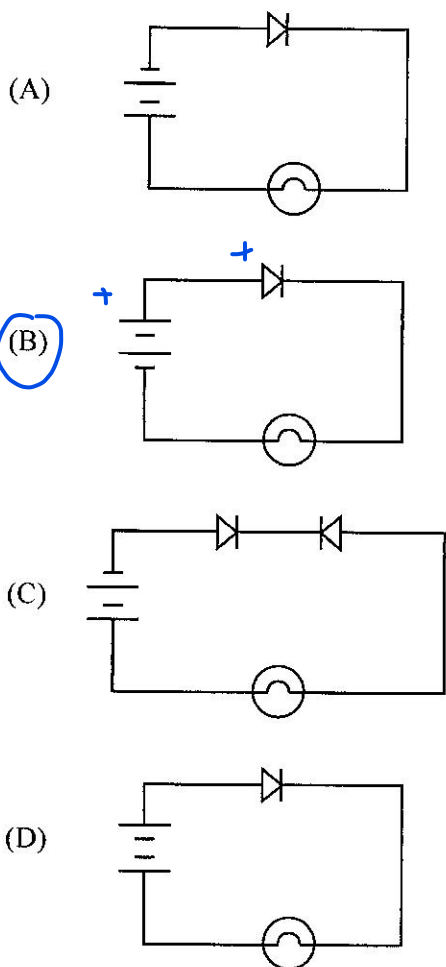
Item 50 refers to the following current–time graph.



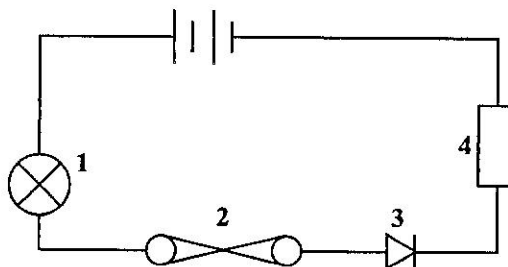
50. What is the period of the current?

- (A) 2 s
- (B) 4 s**
- (C) 6 s
- (D) 8 s

51. In which of the following circuits will the lamp light up?



Item 52 refers to the following diagram.

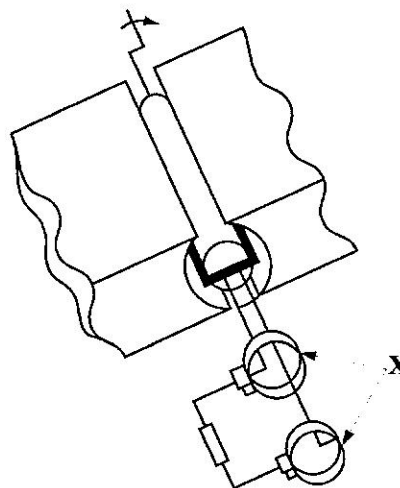


52. Which of the following options shows the correct match of the component name and its number?

Diode Lamp Resistor Fuse

- | | | | | |
|------------|---|---|---|---|
| (A) | 3 | 1 | 4 | 2 |
| (B) | 4 | 3 | 1 | 2 |
| (C) | 1 | 3 | 4 | 2 |
| (D) | 2 | 4 | 3 | 1 |

Item 53 refers to the following diagram of a simple a.c. generator.



53. The parts labelled X in the diagram are known as the

- (A) coils
- (B) armatures
- (C) commutators
- (D) slip rings**

54. 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

55. Which of the following scientists discovered the relationship $E = mc^2$?

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

56. Which of the following CANNOT be deflected by a magnetic field?

- (A) Alpha particles
- (B) Beta particles
- (C) Gamma rays
- (D) Electrons

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

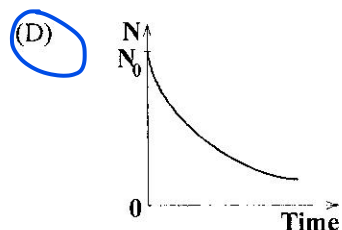
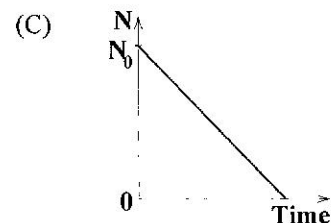
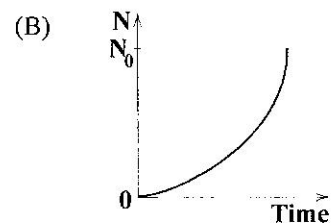
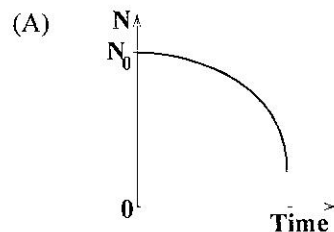
58. Which of the following statements about radioactive decay are correct?

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

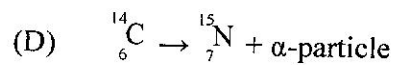
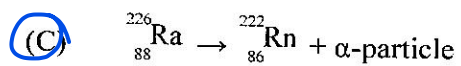
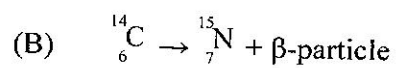
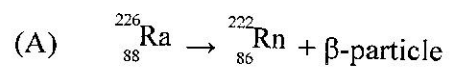
- (A) I and II only
- (B) I and III only
- (C) II and III only
- (D) I, II and III

59. N_0 radioactive nuclei are present in a sample at time $t = 0$.

Which of the following graphs BEST represents the variation with time of the number, N , of undecayed nuclei present?



60. Which of the following equations is correct?



END OF TEST

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



TEST CODE **01238010**

FORM TP 2017095

MAY/JUNE 2017

**CARIBBEAN EXAMINATIONS COUNCIL
CARIBBEAN SECONDARY EDUCATION CERTIFICATE®
EXAMINATION**

PHYSICS

Paper 01 – General Proficiency

1 hour 15 minutes

07 JUNE 2017 (p.m.)

READ THE FOLLOWING INSTRUCTIONS CAREFULLY.

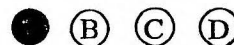
1. This test consists of 60 items. You will have 1 hour and 15 minutes to answer them.
2. In addition to this test booklet, you should have an answer sheet.
3. Each item in this test has four suggested answers lettered (A), (B), (C), (D). Read each item you are about to answer and decide which choice 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.

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.

1. 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.

2. To measure the external diameter of a measuring cylinder most accurately, one should use a

- (A) metre rule
- (B) tape measure
- (C) length of string
- (D) pair of vernier callipers

3. 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

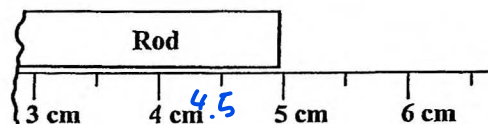
4. Which of the following measurements has three significant figures?

- (A) 0.0293 kg
- (B) 0.94 A
- (C) 5.321 V
- (D) 10.42 m

5. Which of the following remains unchanged with an INCREASE in temperature?

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

Item 6 refers to the following diagram of a rod and a centimetre rule used to measure the rod's length. The end of the rod (not shown) is at the zero mark on the rule.



6. The length of the rod should be written as

- (A) 5 cm
- (B) 5.0 cm
- (C) 5.00 cm
- (D) 4.97 cm

7. When an astronaut is standing on the moon his mass is 70 kg. When he returns to earth his approximate weight will be

- (A) 70 kg
- (B) 420 kg
- (C) 70 N
- (D) 700 N

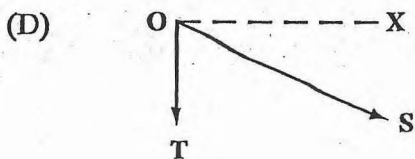
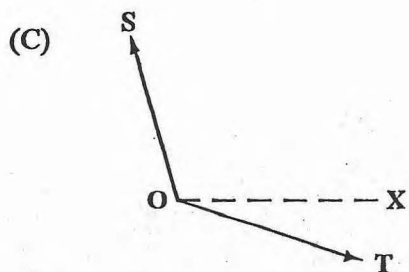
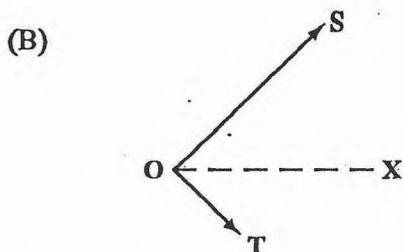
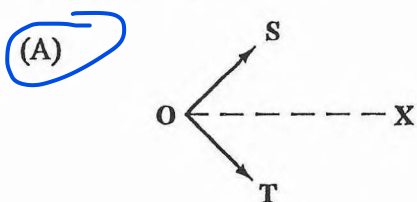
8. An object is removed from the ground and placed on a shelf. Which of the object's properties is expected to increase?

- (A) Mass
- (B) Volume
- (C) Kinetic energy
- (D) Potential energy

9. Which of the following features must be present in a stable, well-designed racing car?

- (A) Low centre of gravity
- (B) Narrow wheel base
- (C) Long front
- (D) Sun roof

10. The diagrams below, drawn to scale, represent two forces, S and T, acting at O. In which of the following is the resultant in the direction OX?



11. 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 \times Time taken

12. Which of the following is the unit of momentum?

(A) kg s^{-1}

(B) kg m s^{-1}

(C) kg m s^{-2}

(D) N m

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

(A) kinetic energy before impact is equal to that after impact

(B) momentum of each body is unchanged

(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

14. Power can be defined as

(A) force \times distance moved

(B) $\frac{\text{force}}{\text{time}}$

(C) $\frac{\text{work done}}{\text{time}}$

(D) work done \times time

15. 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) 99.9 °C to steam at 100.1 °C

(C) 100 °C to steam at 100 °C

(D) 0 °C to steam at 100 °C

16. Which of the following is the POOREST conductor of thermal energy?

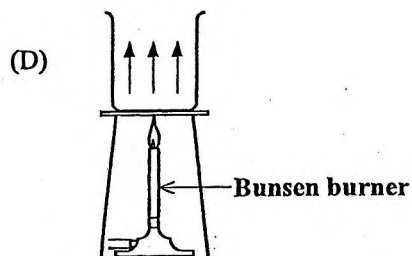
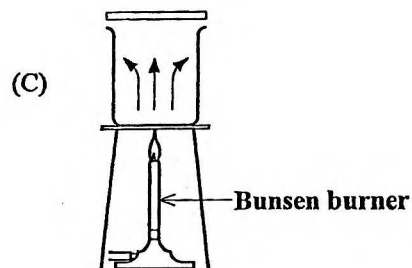
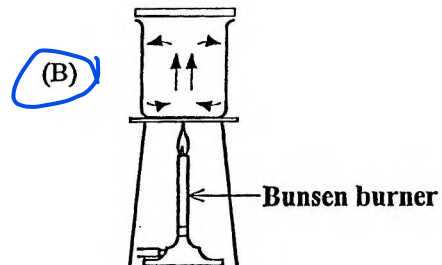
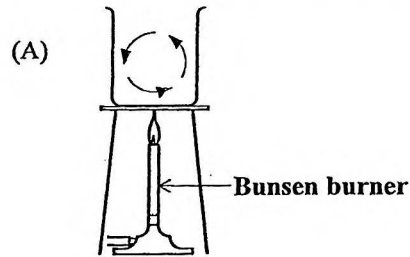
(A) Air

(B) Copper

(C) Mercury

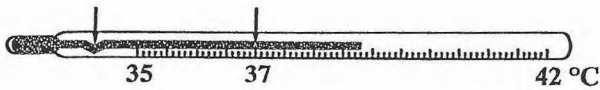
(D) Aluminium

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



18. Boyle's law for a gas can be tested experimentally, provided which of the following remain constant?
- I. Temperature
 - II. Pressure
 - III. Mass
- (A) I and II only
 - (B) I and III only
 - (C) II and III only
 - (D) I, II and III
19. The specific latent heat of fusion of water is 340 kJ kg^{-1} . This means that when 10 kg of water freezes
- (A) 34 kJ of heat is absorbed
 - (B) 34 kJ of heat is given out
 - (C) 3 400 kJ of heat is absorbed
 - (D) 3 400 kJ of heat is given out
20. As the temperature of a liquid rises
- (A) its density increases
 - (B) the forces between its molecules increase
 - (C) the kinetic energy of its molecules increases
 - (D) the pressure it exerts at the bottom of the container increases
21. The specific heat capacity of a material is the energy required to
- (A) melt 1 kg of the material with no change of temperature
 - (B) change the temperature of the material by 1 K
 - (C) change 1 kg of the liquid material to 1 kg of gas without a change in temperature
 - (D) change the temperature of 1 kg of the material by 1 K
22. What is the gain in the gravitational potential energy of a body of weight 200 N, as it rises from a height of 30 m to a height of 35 m above the earth's surface?
- (A) 40 J
 - (B) 100 J
 - (C) 1000 J
 - (D) 2000 J
23. Which of the following statements concerning the radiation of heat is/are true?
- I. Radiation can only take place in a material medium.
 - II. A good absorber is also a good emitter of radiation.
 - III. Dark dull surfaces are better emitters than shiny ones.
- (A) III only
 - (B) I and II only
 - (C) I and III only
 - (D) II and III only
24. An electric kettle full of water is plugged into the mains. The process by which heat travels through the water is
- (A) electrification
 - (B) convection
 - (C) evaporation
 - (D) radiation
25. There are little or no attractive forces between the molecules in a
- (A) liquid and a gas
 - (B) solid and a liquid
 - (C) liquid
 - (D) gas

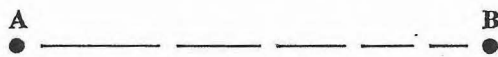
Item 26 refers to the following diagram of a clinical thermometer.



26. What temperature is indicated by the clinical thermometer in the diagram above?

- (A) 38.3 °C
- (B) 38.6 °C
- (C) 38.7 °C
- (D) 38.8 °C

Item 27 refers to the following diagram.



27. In using a slinky to demonstrate longitudinal waves moving from Point A to Point B above, the spring is made to vibrate

- (A) parallel to AB
- (B) perpendicular to AB
- (C) at an obtuse angle to AB
- (D) at an acute angle to AB

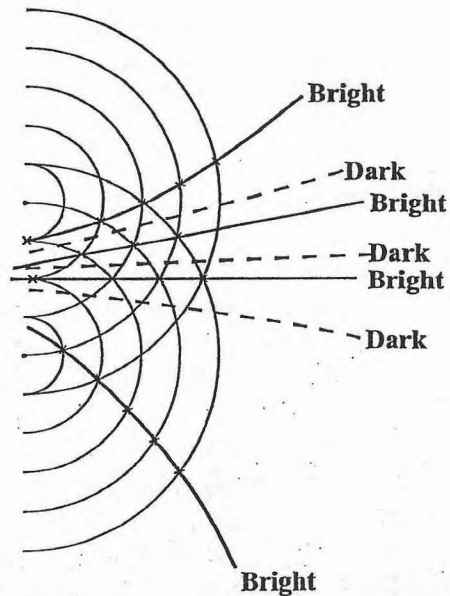
28. Sound waves propagated in a medium consist of

- (A) crests followed by troughs
- (B) compressions followed by troughs
- (C) crests followed by rarefactions
- (D) compressions followed by rarefactions

29. Which of the following statements does NOT provide evidence that sound waves can be reflected?

- (A) Sound can be heard around a corner in open air.
- (B) Speaking tubes can be used for passing messages in ships.
- (C) The depth of the ocean can be measured using ultrasound.
- (D) Echoes can be heard when a person shouts in a large empty room.

Item 30 refers to the following diagram in which two coherent light sources produce an interference pattern on a screen of bright and dark fringes.



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

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

31. Which row in the following table correctly compares X-rays and visible light?

	X-rays	Visible Light
(A)	Particles	Waves
<input checked="" type="radio"/> (B)	High frequency	Low frequency
(C)	Long wavelength	Short wavelength
(D)	Carry less energy	Carries more energy

32. Which of the following, in the 20th century, provided evidence that light has a wave nature?

- (A) Young's double slit experiment
- (B) Newton's prism experiment
- (C) Ripple tank experiment
- (D) Photoelectric effect

33. Which of the following statements is NOT true of the image formed in a plane mirror?

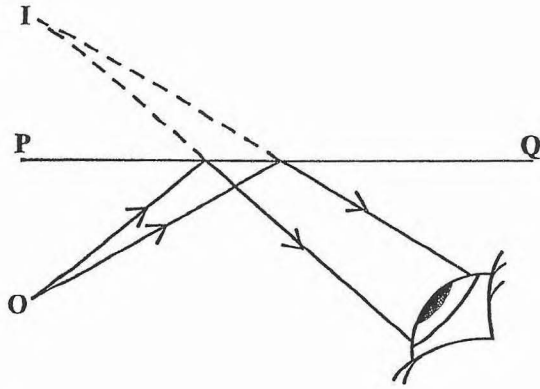
- (A) The image is upright.
- (B) The image is laterally inverted.
- (C) Rays of light from the object pass through corresponding points on the image.
- (D) The image is the same distance behind the mirror as the object is in front.

34. Which of the following can produce a diminished virtual image of a real object?

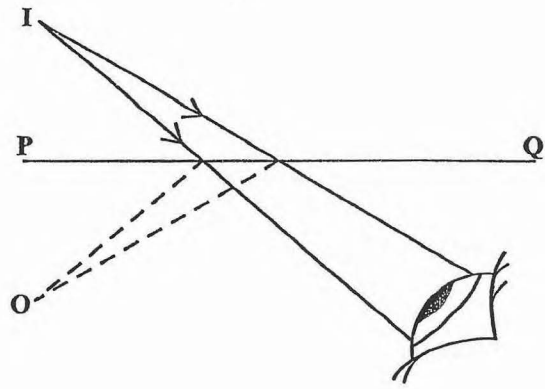
- I. A plane mirror
 - II. A diverging lens
 - III. A converging lens
-
- (A) I only
 - (B) II only
 - (C) II and III only
 - (D) I, II and III

35. An object, O, is viewed in a plane mirror, PQ. Which of the following diagrams correctly shows how the image is formed?

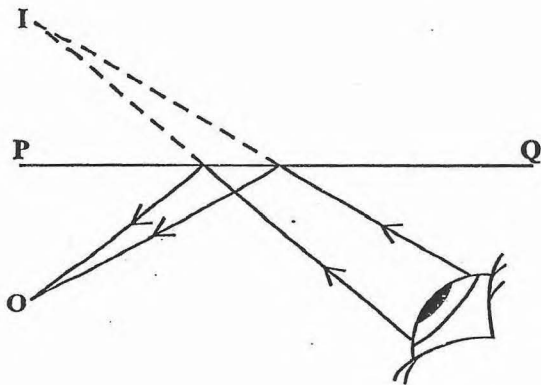
(A)



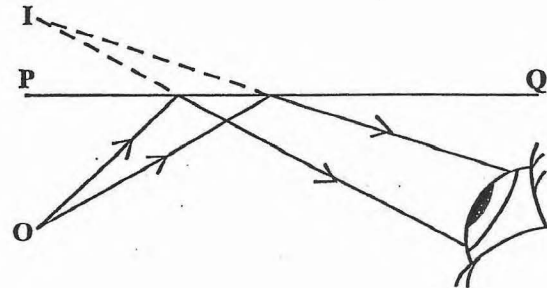
(C)



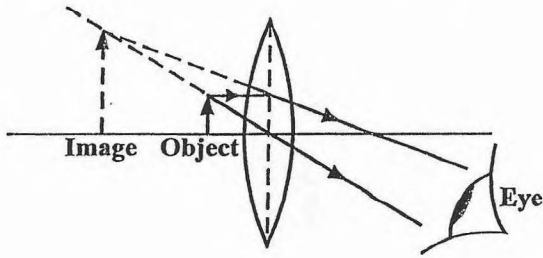
(B)



(D)



Item 36 refers to the following diagram.



36. The diagram above shows the formation of an image by a

- (A) lens camera
- (B) pinhole camera
- (C) telescope
- (D) magnifying glass

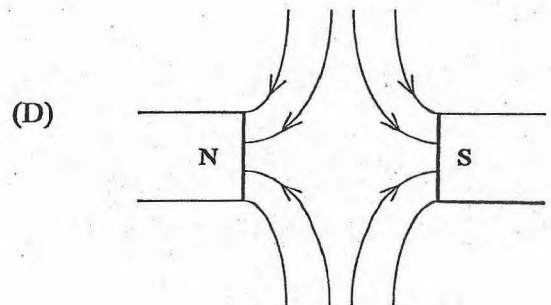
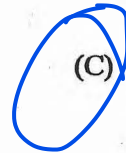
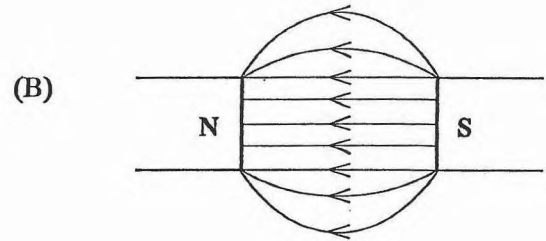
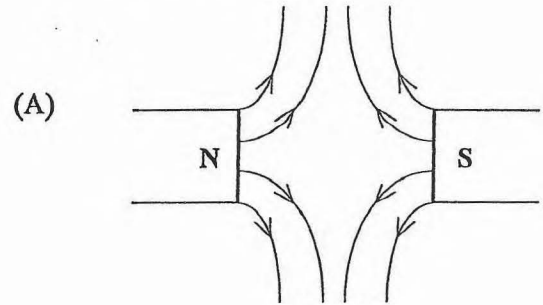
37. Which of the following statements about sound is NOT correct?

- (A) Sound travels more slowly than light.
- (B) Sound does not travel through a vacuum.
- (C) Sound is transmitted as transverse waves.
- (D) Sound may be produced by vibrating systems.

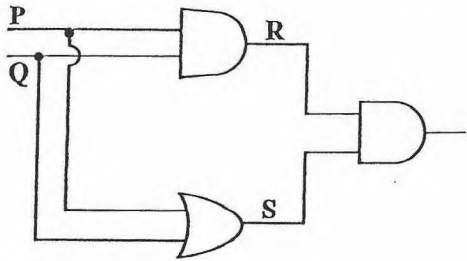
38. A loud high-pitched note results from a wave of

- (A) high frequency, small amplitude
- (B) high frequency, large amplitude
- (C) low frequency, large amplitude
- (D) low frequency, small amplitude

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



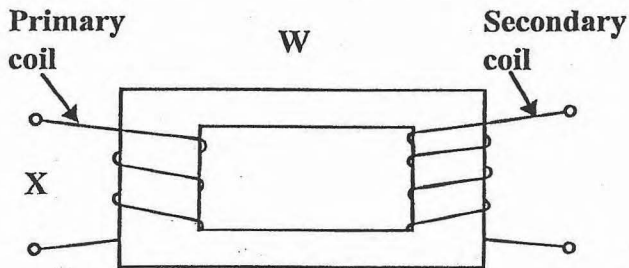
Item 40 refers to the following diagram.



40. What is the output at R and S when a 0 0 input is made at P and Q?

	R	S
(A)	0	0
(B)	1	1
(C)	0	1
(D)	1	0

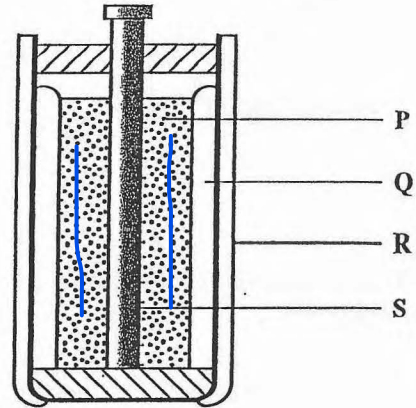
Item 41 refers to the following diagram.



41. Appropriate labels for W and X would be

	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

Item 42 refers to the following diagram which shows the cross section of a dry cell.



42. Which of the labelled parts is the electrolyte?

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

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. A ray of light leaving air enters glass of refractive index 1.6. The angle of refraction is 27° . What is the sine of the angle of incidence?

(A) $1.6 + \sin 27^\circ$

(B) $\frac{1.6}{\sin 27^\circ}$

(C) $1.6 \sin 27^\circ$

(D) $\frac{\sin 27^\circ}{1.6}$

45. In domestic installation systems, which of the following components should be placed in the live wire?

- I. Switches
- II. Circuit breakers
- III. Fuses

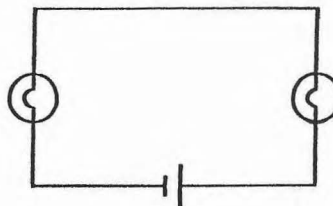
(A) I only

(B) III only

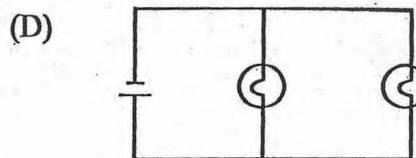
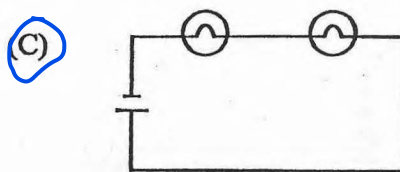
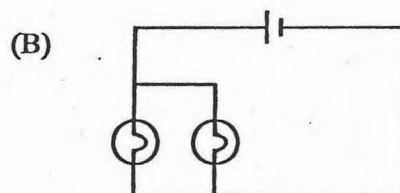
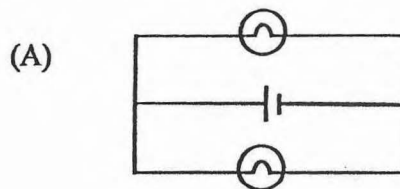
(C) II and III only

(D) I, II and III

Item 46 refers to the following diagram which shows an electric circuit with a cell and two filament bulbs.



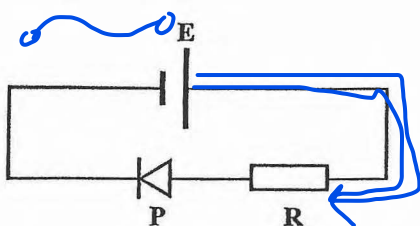
46. Which of the following circuits is electrically the same as the circuit above?



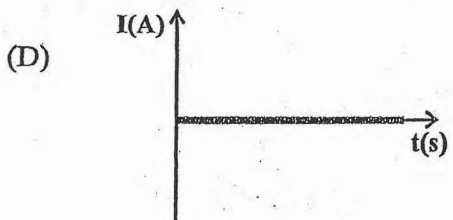
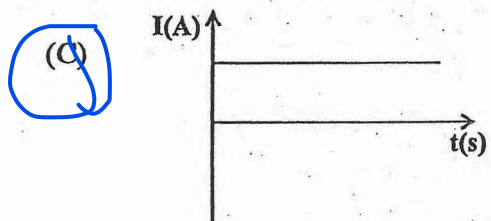
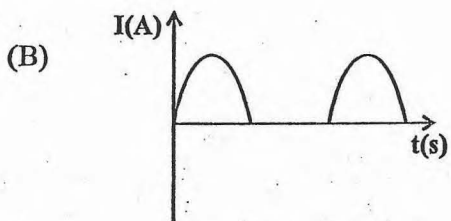
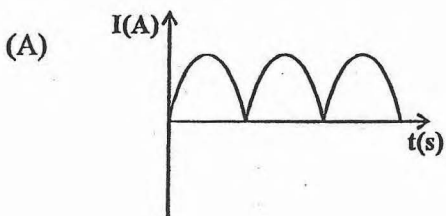
47. When a large current passes through a fuse, which of the following sequence of events is correct?

- (A) Wire gets hot → current is cut off → wire melts
- (B) Wire gets hot → wire melts → current is cut off
- (C) Wire melts → current is cut off → wire gets hot
- (D) Wire melts → wire gets hot → current is cut off

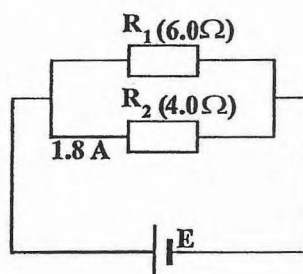
Item 48 refers to the following diagram which shows a cell E, a diode P, and a resistor R, connected in series.



48. Which of the following graphs BEST illustrates the current through R?



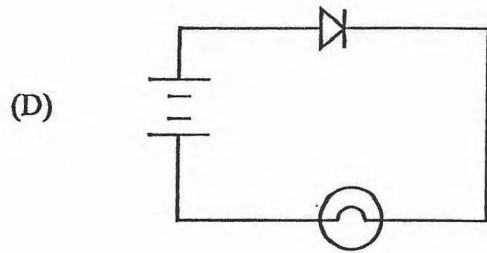
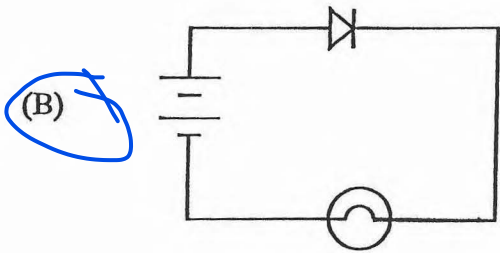
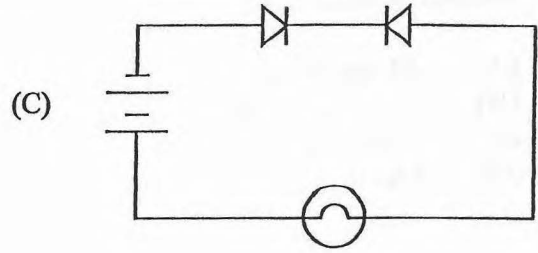
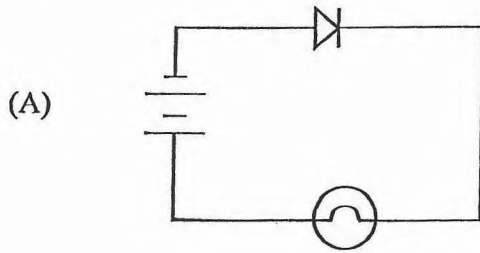
Item 49 refers to the following diagram which shows two resistors, R_1 of 6.0Ω and R_2 of 4.0Ω , in parallel.



49. What is the current through R_1 if the current through R_2 is 1.8 A as recommended?

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

50. In which of the following circuits will the lamp light up?



51. Which of the following pairs of statements is true for BOTH iron and steel?

	Iron	Steel
(A)	easily magnetised	does not retain its magnetism
(B)	not easily magnetised	retains its magnetism well
(C)	easily magnetised	retains its magnetism well
(D)	not easily magnetised	does not retain its magnetism

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

53. Which of the following would be possible symbols for an isotope of the nuclide ${}^A_Z X$?

I. ${}^{A-2}_Z X$

II. ${}^A_{Z-2} X$

III. ${}^{A+2}_Z X$

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

54. ${}^{14}_6 C$ (Carbon 14) decays in accordance with the equation ${}^{14}_6 C \rightarrow {}^{14}_7 N + X$. The emission X is

- (A) a proton
- (B) a gamma ray
- (C) a beta particle
- (D) an alpha particle

55. J.J. Thompson discovered the electron. Which of the following physicists discovered the neutron?

- (A) Bohr
- (B) Thompson
- (C) Rutherford
- (D) Chadwick

Item 56 refers to the following truth table with inputs A and B and output C.

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

56. Which of the following logic gates does the truth table above describe?

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

57. 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
- (D) the nuclear charge and mass are concentrated in a small volume

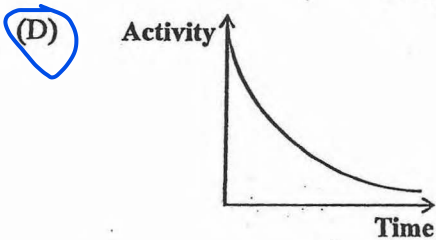
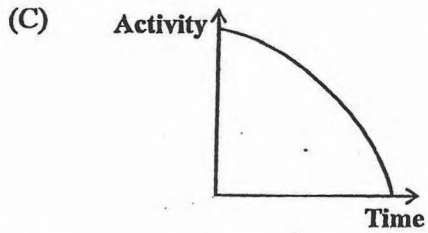
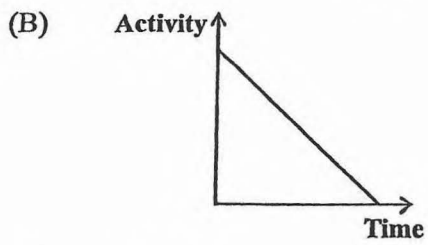
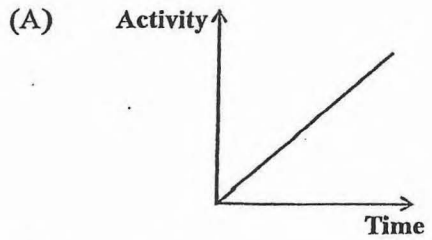
Item 58 refers to the following diagram of a portion of the periodic table.

					He
E	C	N	O	$\frac{9}{F}$	Ne

58. In the diagram above, Element F has 9 protons. How many protons does Element E have?

- (A) 5
- (B) 6
- (C) 8
- (D) 12

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

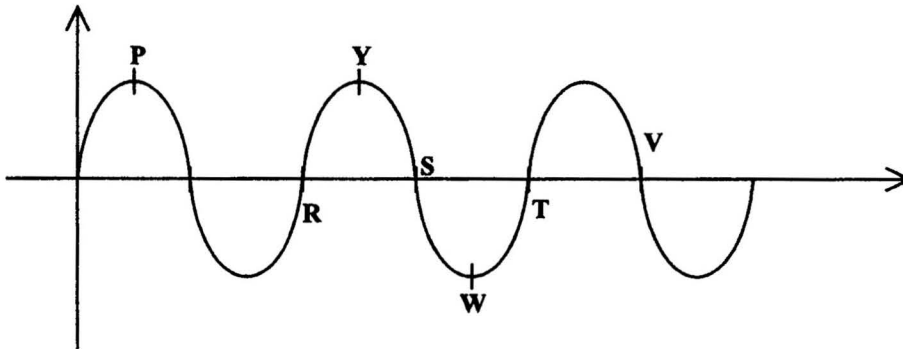


60. Which of the following statements concerning an α -particle are true?

- I. It has twice the charge of a proton.
- II. It has twice the mass of a proton.
- III. It has the same sign charge as a proton.

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

Item 1 refers to the following graph.



1. Which of the following pair of points are in phase?

- (A) Y, W
- (B) P, R
- (C) S, V
- (D) S, T

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

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

3. The SI unit of temperature is the

- (A) Celsius
- (B) Fahrenheit
- (C) Kelvin
- (D) Centigrade

4. In carrying out an experiment to locate a real image using a converging lens, the object can be placed

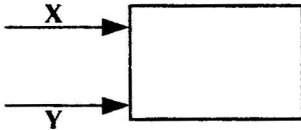
- I. between the focal point and the lens
- II. at the focal point
- III. between the focal point and a point at twice the focal length

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

5. The moment of a force may be 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) product of the force and its perpendicular distance from the turning point to the force
- (D) ratio of the force and its perpendicular distance from the turning point

Item 6 refers to the following diagram which shows two forces, X and Y, applied onto an object.



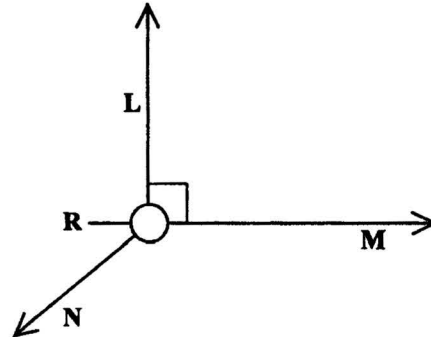
6. What should be the magnitude and direction of a third force which will cause the object to remain stationary?

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

7. When a force F is applied to a spring of original length L the new length becomes $L + x$. What would be the new length of the spring if a force of $\frac{F}{2}$ was applied instead?

- (A) $L + 2x$
- (B) $2(L + x)$
- (C) $L + x$
- (D) $L + \frac{x}{2}$

Item 8 refers to the following diagram which shows three forces of magnitudes L , M and N , all in the same plane and applied on a ring.



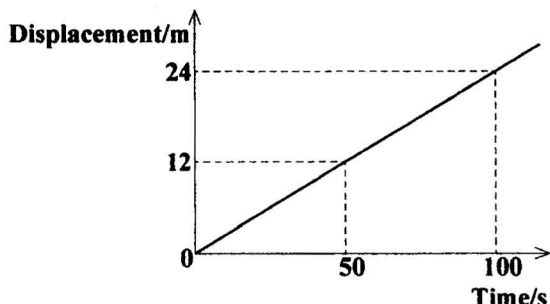
8. Which of the following equations must be TRUE in order for the ring to remain stationary?

- (A) $L^2 = M^2 + N^2$
- (B) $N^2 = L^2 + M^2$
- (C) $N^2 = L^2 - M^2$
- (D) $N = L + M$

9. Two forces of 8 N and 10 N CANNOT give a resultant of

- (A) 1 N
- (B) 2 N
- (C) 9 N
- (D) 18 N

Item 10 refers to the following graph which shows how the displacement of a runner from a starting line varies with time.



10. From the graph it can be deduced that the runner is

- (A) not moving
- (B) going at a steady speed
- (C) going faster and faster
- (D) going slower and slower

11. A block is allowed to fall freely towards the ground. As it falls, its gravitational potential energy

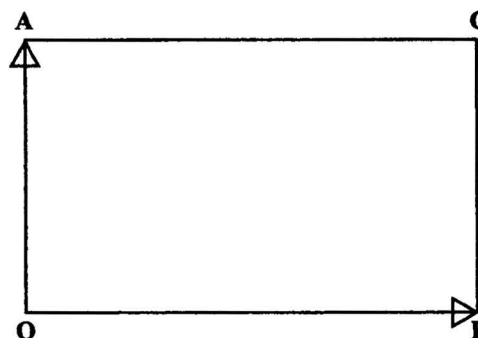
- (A) increases
- (B) remains constant
- (C) is converted to internal energy
- (D) is converted to kinetic energy

12. Two smooth spheres, A and B, collide head on. Which of the following statements is/are TRUE?

- I. The momentum of A is the same after collision as it was before.
- II. The momentum of B is the same after collision as it was before.
- III. The total momentum of A and B is the same after collision as it was before.

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

Item 13 refers to the following diagram which shows two vectors of magnitudes a and b represented respectively by \overline{OA} and \overline{OB} .



13. The vectors act at point O and are directly perpendicular to each other. Which of the following pairs represents BOTH the magnitude and direction of their resultant?

	Magnitude	Direction
(A)	$a^2 + b^2$	\overline{OC}
(B)	$a + b$	\overline{CO}
(C)	$\sqrt{a^2 + b^2}$	\overline{CO}
<input checked="" type="radio"/> (D)	$\sqrt{a^2 + b^2}$	\overline{OC}

14. The height of liquid in a vessel is h and its density ρ . If the atmospheric pressure is X and the acceleration due to gravity is g , what is the pressure on the base of the vessel? (All quantities are in SI units.)

- (A) $X + h\rho$
- (B) $(X + h)\rho g$
- (C) $X + h\rho g$
- (D) $(X + h\rho)g$

15. The specific latent heat of vaporization of water is $2.26 \times 10^6 \text{ J kg}^{-1}$. When 0.01 kg of water is converted into steam it

- (A) absorbs $2.26 \times 10^4 \text{ J}$
- (B) gives out $2.26 \times 10^4 \text{ J}$
- (C) absorbs $2.26 \times 10^8 \text{ J}$
- (D) gives out $2.26 \times 10^8 \text{ J}$

16. A body weighs 60 N on earth. When taken to the moon the body weighs 10 N. Which of the following would be the MAIN reason(s) for this fact?

- I. The earth rotates more slowly than the moon.
 - II. The earth has a larger mass than the moon.
 - III. On the moon there is no atmosphere.
- (A) I only
 - (B) II only
 - (C) II and III only
 - (D) I, II and III

Item 17 refers to the following diagram of a clinical thermometer.



17. What temperature is indicated by the clinical thermometer in the diagram above?

- (A) $38.3 \text{ }^\circ\text{C}$
- (B) $38.6 \text{ }^\circ\text{C}$
- (C) $38.7 \text{ }^\circ\text{C}$
- (D) $38.8 \text{ }^\circ\text{C}$

18. Under what conditions may we apply the following gas formula to solve problems?

$$\frac{P_1 V_1}{T_1} = \frac{P_2 V_2}{T_2}$$

- I. The mass of gas must be constant.
- II. P_1 and P_2 must be measured in mm of mercury.
- III. The units of the product P_1 and V_1 must be the same as the units of the product of P_2 and V_2 .

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

19. Who was responsible for arriving at the conclusion that measured amounts of electrical and mechanical energy can be converted to proportionate amounts of heat energy?

- (A) Joule
- (B) Rumford
- (C) Coulomb
- (D) Newton

20. Which of the following methods is the MOST suitable means of heating a brass bob in order to determine its specific heat capacity by the method of mixtures?

- (A) Subjecting it to an open flame for ten minutes
- (B) Placing it in contact with an electrical heater for ten minutes
- (C) Placing it in a boiling water bath for ten minutes
- (D) Subjecting it to an infrared beam for ten minutes

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

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

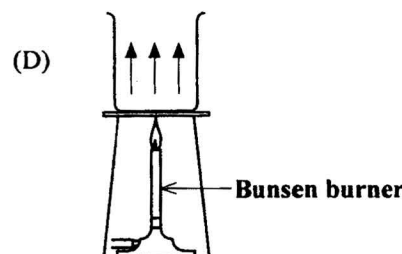
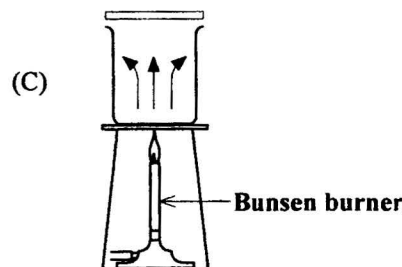
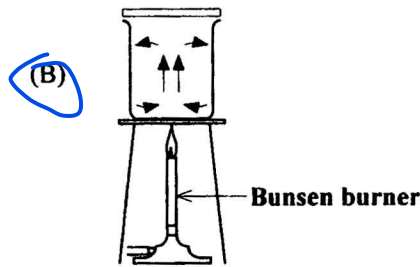
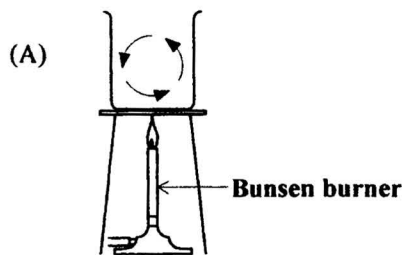
22. Which of the following statements is FALSE?

- (A) Evaporation occurs at room temperature only.**
- (B) Evaporation requires heat energy and causes cooling.
- (C) Evaporation occurs only at the surface.
- (D) In evaporation the faster molecules escape the liquid.

23. Most refrigerators are painted white because a white surface is

- (A) easily cleaned
- (B) a good reflector of thermal radiation**
- (C) a good absorber of radiation
- (D) a poor reflector of radiation

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



25. The heat from a nearby fire reaches us MAINLY by

- (A) conduction
- (B) convection
- (C) absorption
- (D) radiation**

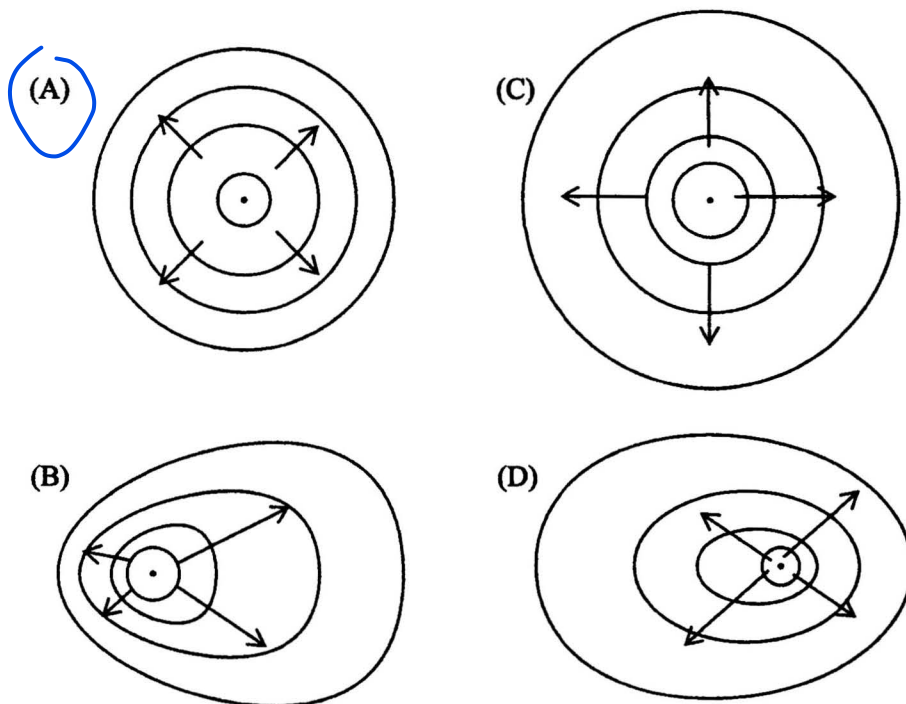
26. Which of the following is the POOREST conductor of thermal energy?

- (A) Air
- (B) Copper
- (C) Mercury
- (D) Aluminium

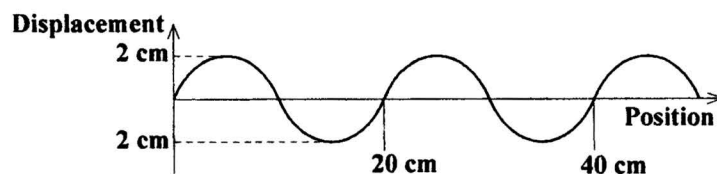
27. Which of the following descriptions refer to BOTH a good absorber and a good emitter of thermal (heat) energy?

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

28. Which of the following diagrams BEST represents the wave generated in a ripple tank by a small spherical dipper vibrating at a constant frequency?



Item 29 refers to the following diagram which shows the instantaneous profile of a wave travelling across a water surface.



29. From the information given, the frequency is

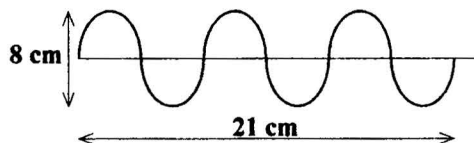
- (A) $\frac{1}{20}$ Hz
- (B) 10 Hz
- (C) 20 Hz
- (D) unknown

30. The range of frequencies detectable by the normal human ear is

- (A) 10 Hz to 100 Hz
- (B) 20 Hz to 20 KHz
- (C) 10 Hz to 10 KHz
- (D) 20 Hz to 2000 KHz

20 - 20000

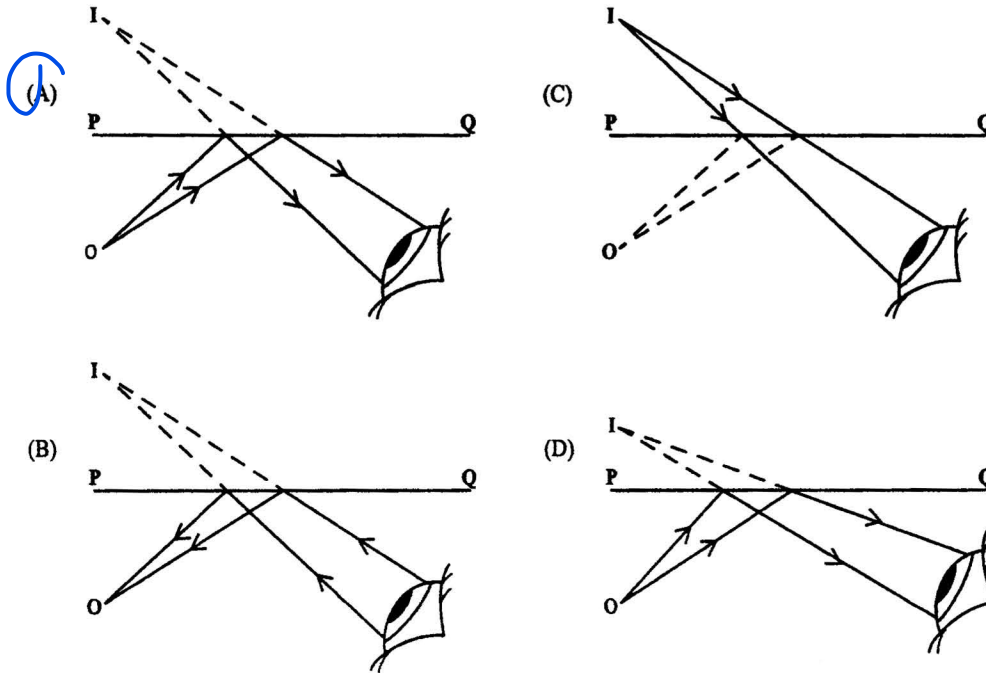
Item 31 refers to the following diagram which illustrates the side view of a water wave.



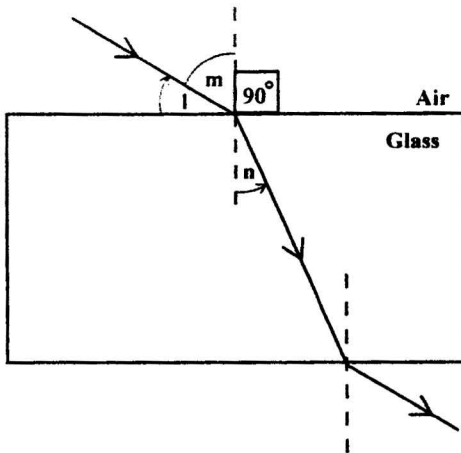
31. The amplitude of the wave is

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

32. An object O is viewed in a plane mirror PQ. Which of the following diagrams correctly shows the formation of the image?



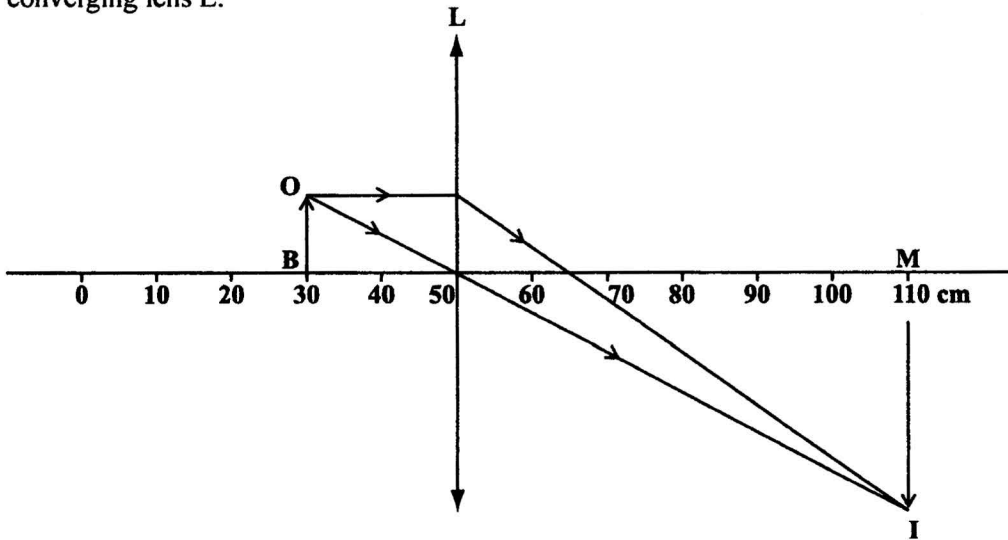
Item 33 refers to the following diagram.



33. From the diagram above, the refractive index of glass can be determined from the ratio

- (A) $\frac{\sin m}{\sin l}$
- (B) $\frac{\sin m}{\sin n}$
- (C) $\frac{\sin l}{\sin 90}$
- (D) $\frac{\sin 90}{\sin n}$

Item 34 refers to the following diagram which represents an object OB standing on the axis of the converging lens L.



IM represents the image formed. The lens is placed at the 50 cm mark of a scale marked every 10 cm.

34. The focal length of the lens is

- (A) 15 cm
- (B) 20 cm
- (C) 60 cm
- (D) 65 cm

$$\frac{1}{f} = \frac{1}{u} + \frac{1}{v}$$

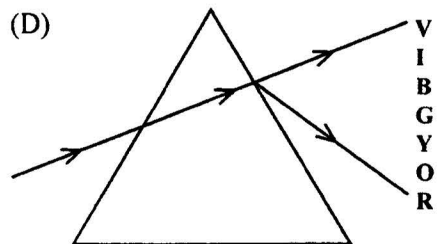
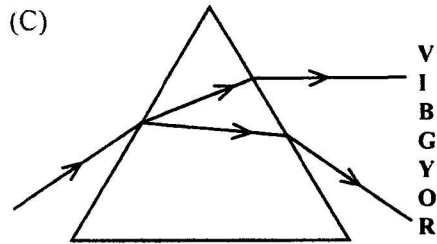
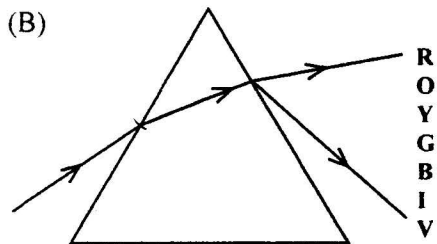
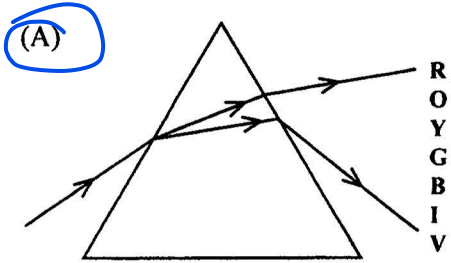
$$\frac{1}{f} = \frac{1}{20} + \frac{1}{60}$$

$$\frac{1}{f} = \frac{3}{60} = \frac{1}{20}$$

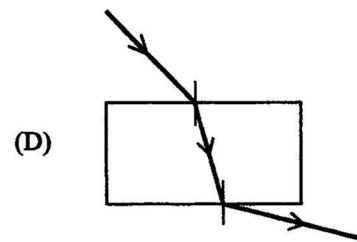
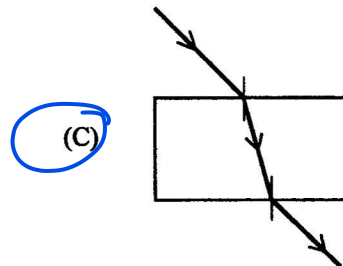
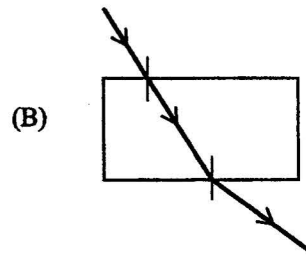
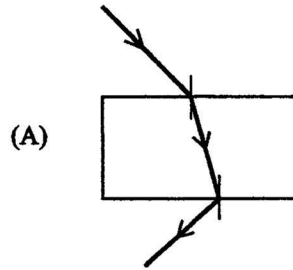
$$f = 20$$

$$\frac{1}{f} = \frac{4}{60}$$

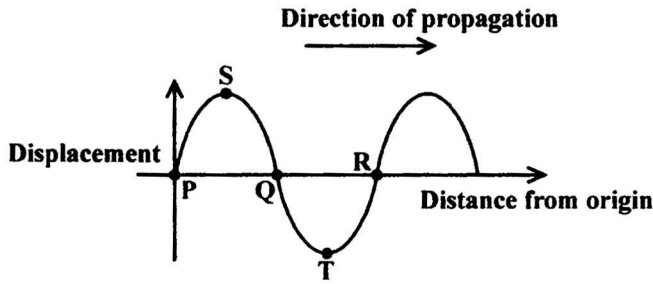
35. A ray of white light enters a transparent glass prism. In which of the following diagrams is the dispersion of light correctly illustrated?



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



Item 37 refers to the following diagram.



37. Which of the following statements about the wave shown in the diagram is/are true?

- I. Points P, Q and R are in phase.
- II. Points S and T are out of phase.
- III. The wavelength of the wave is the distance PR.

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

38. In which of the following would a change be detected if sounds of differing frequencies are played in succession? (Assume amplitude constant.)

- (A) Loudness
- (B) Speed
- (C) Pitch
- (D) Timbre

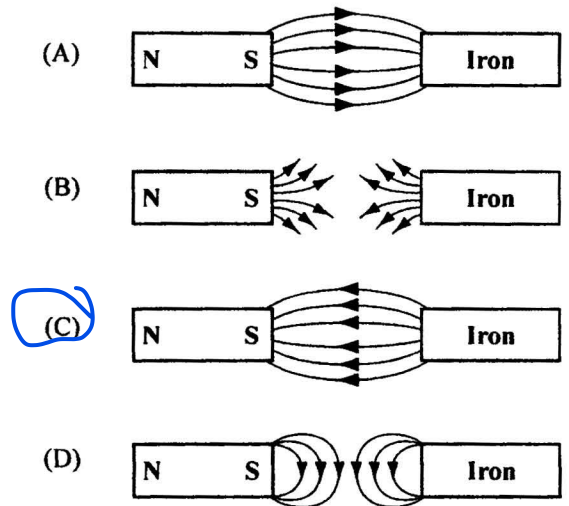
39. Magnetic induction occurs when

- (A) an N pole attracts a 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

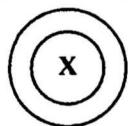
40. Which of the following electromagnetic waves has the SHORTEST wavelength?

- (A) Gamma rays
- (B) Infrared waves
- (C) Radio waves
- (D) Ultraviolet radiation

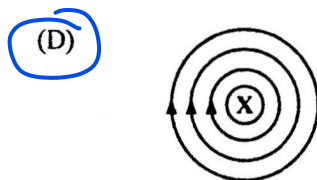
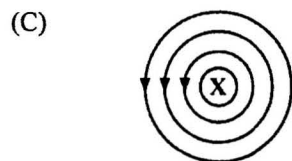
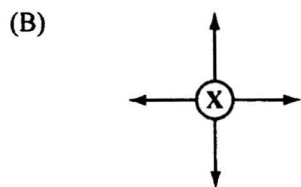
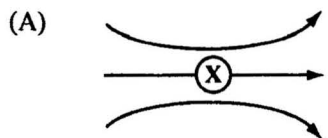
41. Which of the following diagrams shows the magnetic field between a bar magnet and a piece of iron?



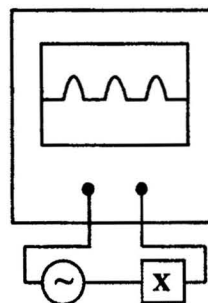
Item 42 refers to the following diagram which represents a straight wire carrying a current into the plane of a piece of paper.



42. Which of the following diagrams BEST represents the magnetic field around the wire?



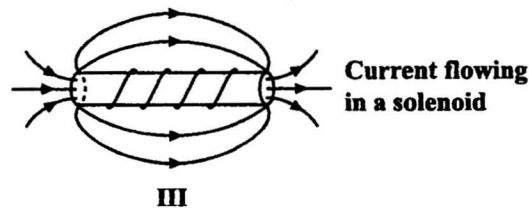
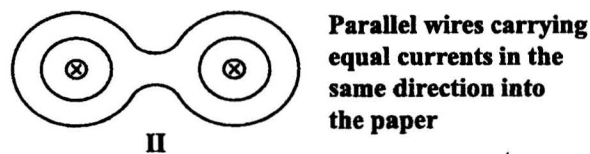
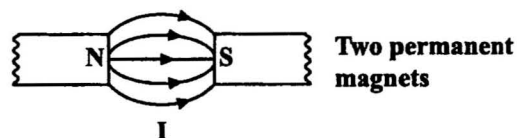
Item 43 refers to the following diagram which shows the trace on the screen of an oscilloscope wired to an a.c. supply and a device X.



43. X is probably a

- (A) diode
- (B) resistor
- (C) solenoid
- (D) transformer

Item 44 refers to the following diagrams labelled I, II and III.




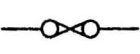

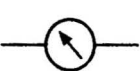
44. Which of the diagrams above correctly show(s) the magnetic fields created?

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

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

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

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

- (A) 
- (B) 
- (C) 
- (D) 

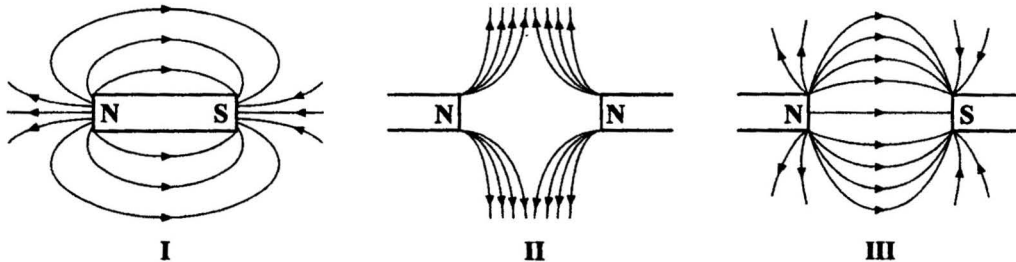
47. An ammeter has a very low resistance so that it can be placed in

- (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 the ammeter does not heat up
- (D) series with a component and the ammeter does not heat up

48. 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 200Ω attached to the secondary coil. What is the current in the secondary circuit?

- (A) 0.33 A
- (B) 1.0 A
- (C) 1.5 A
- (D) 3.0 A

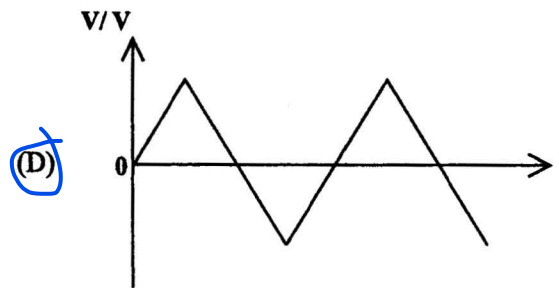
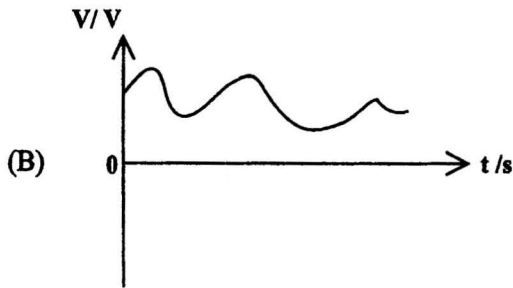
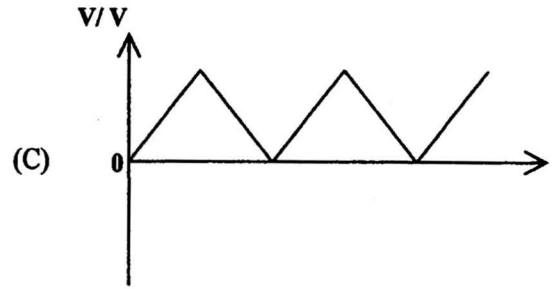
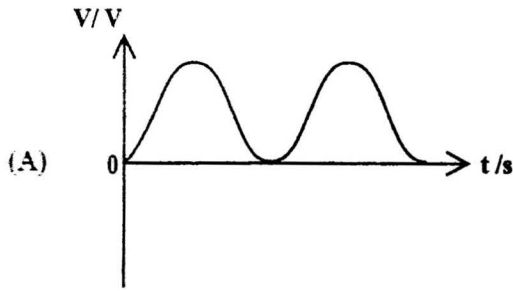
49. The following diagrams labelled I, II and III, show the magnetic field lines plotted by a student.



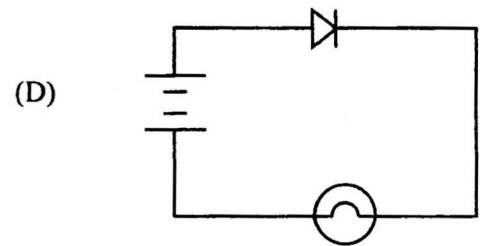
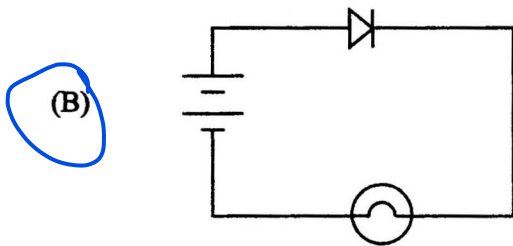
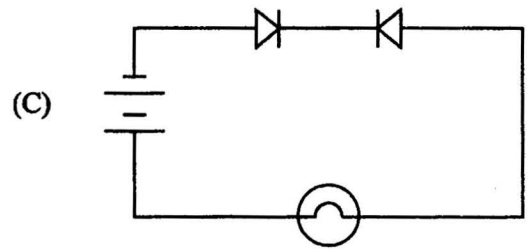
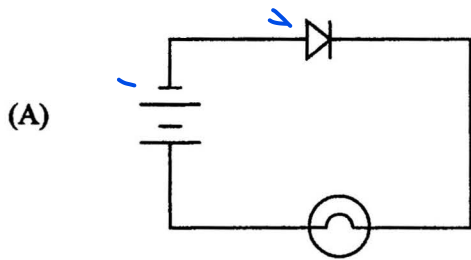
Which of the following are correct?

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

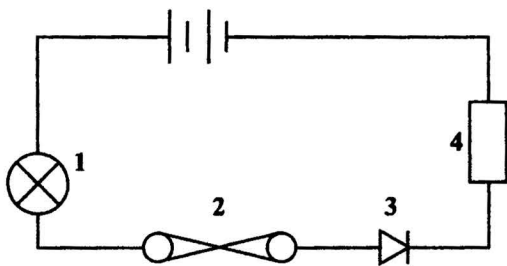
50. Which of the following voltage (V) – time (t) graphs BEST represents an a.c. voltage?



51. In which of the following circuits will the lamp light up?



Item 52 refers to the following diagram.



52. Which of the following options shows the correct match of the component name and its number?

Diode Lamp Resistor Fuse

- | | | | | |
|-----|---|---|---|---|
| (A) | 3 | 1 | 4 | 2 |
| (B) | 4 | 3 | 1 | 2 |
| (C) | 1 | 3 | 4 | 2 |
| (D) | 2 | 4 | 3 | 1 |

53. 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

54. 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
 (D) the nuclear charge and mass are concentrated in a small volume

55. Which of the following CANNOT be deflected by a magnetic field?

- (A) Alpha particles
 (B) Beta particles
 (C) Gamma rays
 (D) Electrons

56. Which of the following are definitions of the term 'half-life' of a radioactive nuclide?

- I. The time taken for the activity of any given sample to fall to half its original value.
- II. The time taken for half the nuclei present in any given sample to decay.
- III. It is half the average number of disintegrations per second.

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

57. The nuclide ${}_{90}^{234}\text{Th}$ 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 describe the nature of the three types of emissions from radioactive substances?

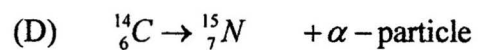
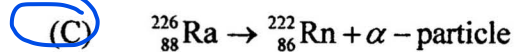
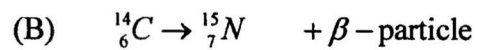
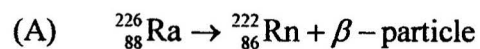
- I. Alpha radiation is a stream of helium nuclei.
- II. Beta radiation is a stream of electrons.
- III. Gamma radiation is an electromagnetic radiation of very high frequency.

- (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 scientists discovered the relationship $E = mc^2$?

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

60. Which of the following equations for nuclear reactions is correct?



END OF TEST

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



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**

MAY/JUNE 2015

FORM TP 2015099

**CARIBBEAN EXAMINATIONS COUNCIL
CARIBBEAN SECONDARY EDUCATION CERTIFICATE®
EXAMINATION**

PHYSICS

Paper 01 – General Proficiency

1 hour 15 minutes

04 JUNE 2015 (a.m.)

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

Sample Answer

- (A) ● (C) (D)

The best answer to this item is “metre”, so (B) 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. 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.

Copyright © 2013 Caribbean Examinations Council
All rights reserved.



1. 0.0000462 N expressed in standard form is

- (A) 4.62×10^{-5} N
- (B) 4.62×10^{-4} N
- (C) 462×10^{-4} N
- (D) 4.62×10^5 N

2. One gram is equal to

- (A) 10 milligrams
- (B) 100 milligrams
- (C) 1 000 milligrams
- (D) 10 000 milligrams

3. 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

4. Which of the following measurements has three significant figures?

- (A) 0.0293 kg
- (B) 0.94 A
- (C) 5.321 V
- (D) 10.42 m

5. Which of the following quantities remain unchanged with an INCREASE in temperature?

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

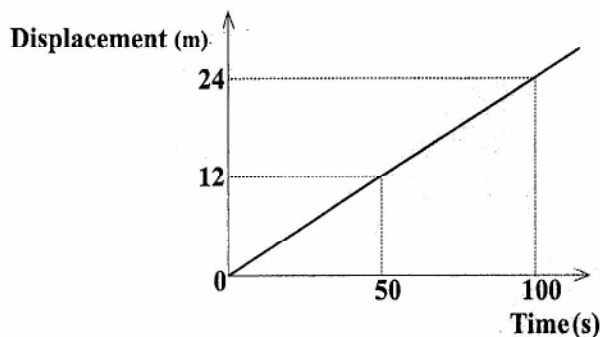
6. A boy measured the height of a laboratory table with a metre rule. Which of the following is MOST likely to be correct?

- (A) 0.00895 m
- (B) 0.0895 m
- (C) 0.895 m
- (D) 8.95 m

7. The kinetic energy of a body of mass, m , and velocity, v , is given by

- (A) $\frac{m}{v}$
- (B) mv
- (C) $\frac{mv^2}{2}$
- (D) mv^2

Item 8 refers to the following graph.



8. The graph above shows how the displacement of a runner from a starting line varies with time. This runner is

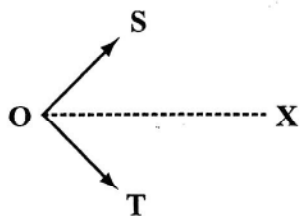
- (A) not moving
- (B) going at a steady speed
- (C) going faster and faster
- (D) going slower and slower

9. A falling raindrop reaches a constant speed when

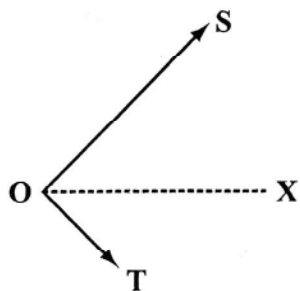
- (A) there is no net force acting on it
- (B) the upthrust due to the air is at a minimum
- (C) the pull of the earth on the raindrop is equal to the weight of the raindrop
- (D) the air surrounding the raindrop becomes saturated with water vapour

10. The diagrams below, drawn to scale, represent two forces, S and T, acting at O. In which of the following is the resultant in the direction, OX?

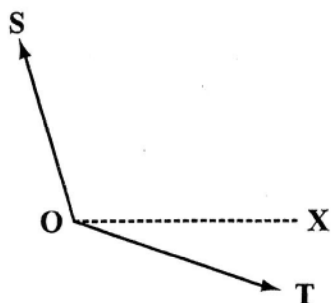
(A)



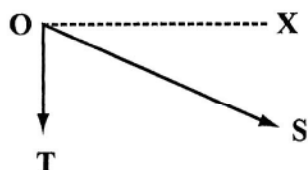
(B)



(C)



(D)



11. When a force F is applied to a spring of original length L , the new length becomes $L + x$. What would be the new length of the spring if a force of $\frac{F}{2}$ was applied instead?

- (A) $L + 2x$
- (B) $2(L + x)$
- (C) $L + x$

(D) $L + \frac{x}{2}$

12. Which of the following units is for momentum?

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

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

- (A) kinetic energy before impact is equal to that after impact
- (B) momentum of each body is unchanged
- (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

14. Power can be defined as
- (A) force \times distance moved
 - (B) $\frac{\text{force}}{\text{time}}$
 - (C) $\frac{\text{work done}}{\text{time}}$
 - (D) work done \times time

15. An object is removed from the ground and placed on a shelf. Which of its properties is expected to increase?
- (A) Mass
 - (B) Volume
 - (C) Potential energy
 - (D) Kinetic energy

16. Pressure in a liquid can be calculated using the formula
- $$P = \rho gh$$

Which sets of units below will give the pressure in the SI unit?

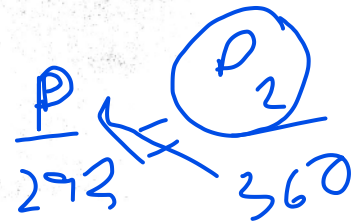
- | | ρ | g | h |
|--------------------------------------|--------------------|--------------------|----|
| (A) | g cm^{-3} | m s^{-2} | mm |
| <input checked="" type="radio"/> (B) | kg m^{-3} | N kg^{-1} | m |
| (C) | g cm^{-3} | N kg^{-1} | m |
| (D) | kg m^{-3} | cm s^{-2} | cm |

17. A bubble of gas rises to the surface of a soft drink. This is because the
- (A) density of the gas is greater than the density of the drink
 - (B) upthrust on the bubble is greater than the weight of the bubble
 - (C) upthrust on the bubble is greater than the weight of water it displaces
 - (D) weight of the water displaced by the bubble is less than the weight of the bubble

18. Boyle's law for a gas can be tested experimentally, provided which of the following is/are maintained constant?
- I. Temperature
 - II. Pressure
 - III. Density
 - IV. Mass
- (A) III only
 - (B) I and II only
 - (C) I and IV only
 - (D) I, II and III only

19. A light bulb is filled with a gas at a temperature of 293 K. If the initial pressure of the gas is P , what will it be when the temperature increases to 360 K?

- (A) $\frac{393}{360} \times P$
- (B) $\frac{360}{293} \times P$
- (C) $\frac{293}{360} \times \frac{1}{P}$
- (D) $\frac{360}{293} \times \frac{1}{P}$



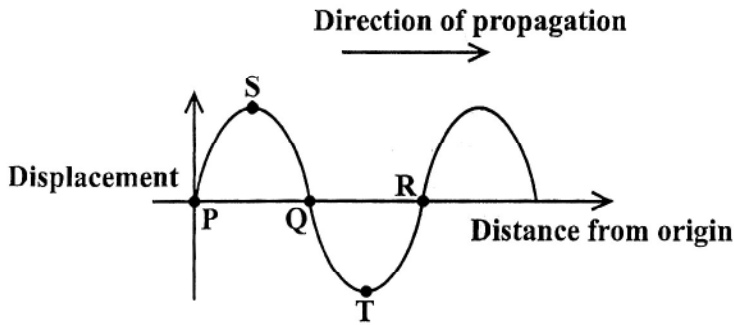
20. Which of the following ranges of temperature is MOST suitable for a clinical thermometer?
- (A) 0°C to 44°C
 - (B) -10°C to 110°C
 - (C) 35°C to 100°C
 - (D) 35°C to 44°C

21. The specific heat capacity of a material is the energy required to
- (A) melt 1 kg of the material with no change of temperature
 - (B) change the temperature of the material by 1 K
 - (C) change 1 kg of the liquid material to 1 kg of gas without a change in temperature
 - (D) change the temperature of 1 kg of the material by 1 K
22. In the pressure law, which of the following statements is/are true?
- I. Ratio of pressure to Kelvin temperature is constant.
 - II. Volume is constant.
 - III. Pressure is constant.
- (A) I only
 - (B) III only
 - (C) I and II only
 - (D) I, II and III
23. Which of the following statements concerning the radiation of heat is true?
- I. Radiation can only take place in a material medium.
 - II. A good absorber is also a good emitter of radiation.
 - III. Dark dull surfaces are better emitters than shiny ones.
- (A) III only
 - (B) I and II only
 - (C) I and III only
 - (D) II and III only
24. An electric kettle full of water is plugged into the mains. The process by which heat travels through the water is
- (A) electrification
 - (B) convection
 - (C) evaporation
 - (D) radiation
25. There are NO attractive forces between the molecules in a
- (A) liquid and gas
 - (B) solid and a liquid
 - (C) liquid
 - (D) gas
26. A gas occupies 2 m³ at 27 °C and 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) 54.0 °C
 - (B) 27.0 °C
 - (C) 6.75 °C
 - (D) - 198 °C
27. Which of the following is the correct relation between the wavelength, λ , speed, v , and frequency, f , of a wave?
- (A) $\lambda = f v$
 - (B) $f = \frac{\lambda}{v}$
 - (C) $f = \frac{v}{\lambda}$
 - (D) $\lambda = \frac{f}{v}$

28. Which of the following waves are NOT transverse waves?

- (A) Water waves on the sea
- (B) Light waves from a street lamp
- (C) Sound waves from a guitar string
- (D) Radio waves travelling from a satellite

Item 29 refers to the following diagram.

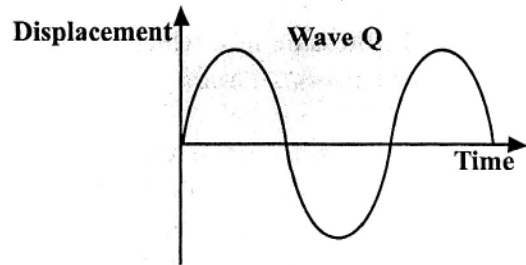
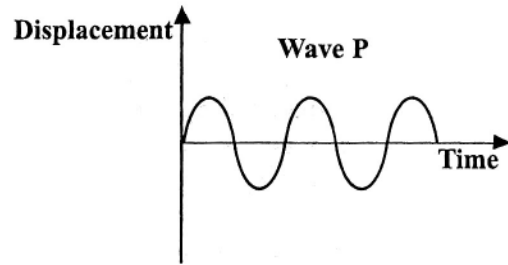


29. Which of the following statements about the wave shown in the diagram above is/are true?

- I. Points P, Q and R are in phase.
- II. Points S and T are out of phase.
- III. The wavelength of the wave is the distance PR.

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

Item 30 refers to the following graphs (with axes having the same scales) of two sound waves, P and Q.



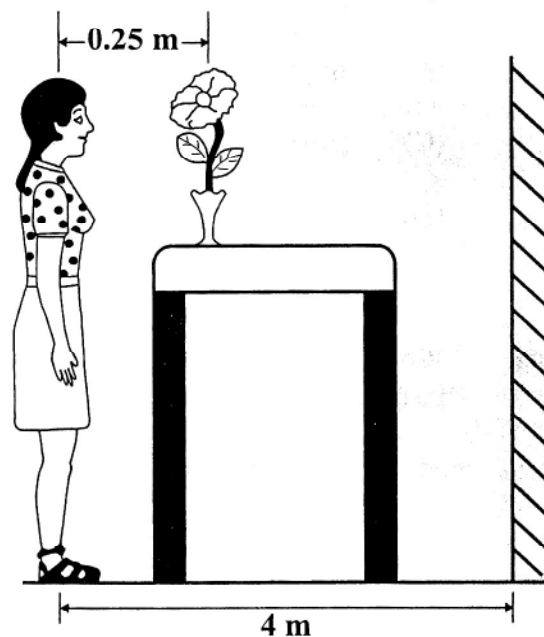
30. Which of the following statements is true?

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

31. The normal hearing range of a young person is about

- (A) 20 Hz to 2 000 Hz
- (B) 20 Hz to 20 000 Hz
- (C) 200 Hz to 2 000 Hz
- (D) 200 Hz to 20 000 Hz

Item 32 refers to the following diagram which shows a lady facing a plane mirror which is 4.0 m away from her.



32. The lady views the image of a vase, which is 0.25 m in front of her. How far from her is the image of the vase?

- (A) 3.75 m
- (B) 4.25 m
- (C) 7.75 m
- (D) 8.00 m

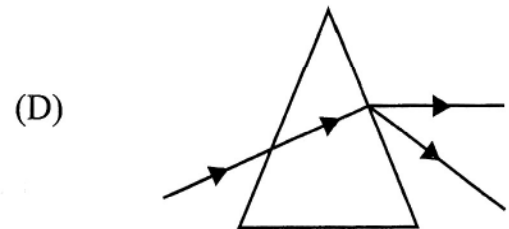
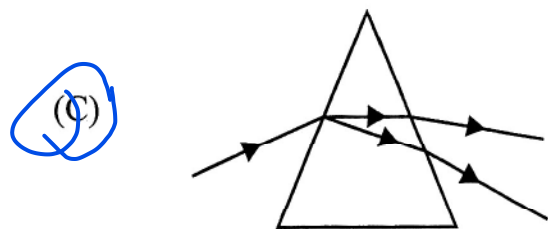
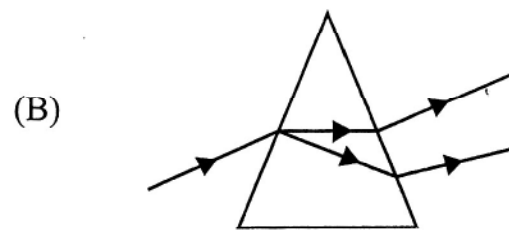
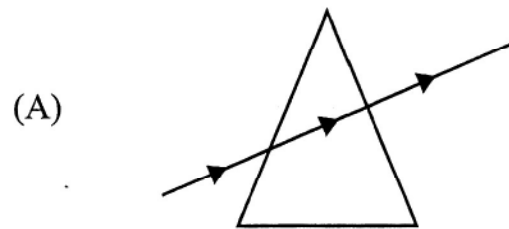
33. Which of the following events does NOT suggest that light travels in straight lines?

- (A) Sunbeams streaming through trees
- (B) A rainbow formation in the sky
- (C) The formation of shadows
- (D) Light from a projector on its way to a screen

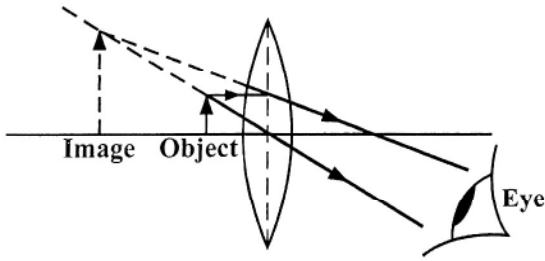
34. The specific latent heat of fusion of water is 340 kJ kg^{-1} . This means that when 10 kg of water freezes

- (A) 34 kJ of heat is absorbed
- (B) 34 kJ of heat is given out
- (C) 3 400 kJ of heat is absorbed
- (D) 3 400 kJ of heat is given out

35. Which of the following diagrams BEST represents the passage of a beam of white light through a triangular glass prism?



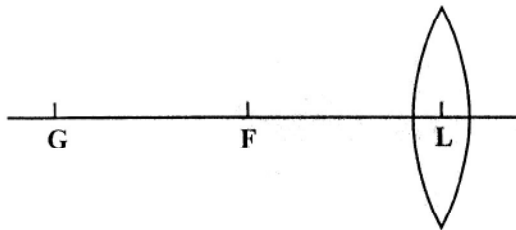
Item 36 refers to the following diagram.



36. The diagram above shows the formation of an image by a

- (A) lens camera
- (B) pin hole camera
- (C) telescope
- (D) magnifying glass

Item 37 refers to the following diagram which represents a thin converging lens, L, with a principal axis GL.



37. If FL is the focal length of the lens and $GF = FL$, then where should an object be placed so as to produce a virtual magnified image?

- (A) At G
- (B) To the left of G
- (C) Between F and G
- (D) Between L and F

38. A ray of light in air strikes a glass block at an angle of incidence of 0° . The light will be

- (A) undeviated
- (B) totally reflected
- (C) refracted at 90° to normal
- (D) refracted at an unknown angle

39. When a polythene rod is rubbed with a cloth, it becomes

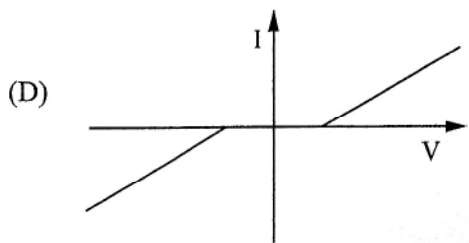
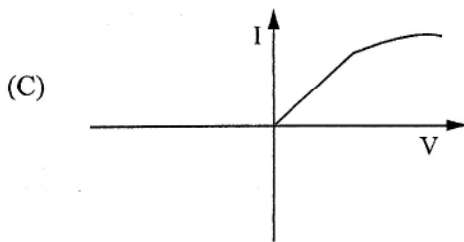
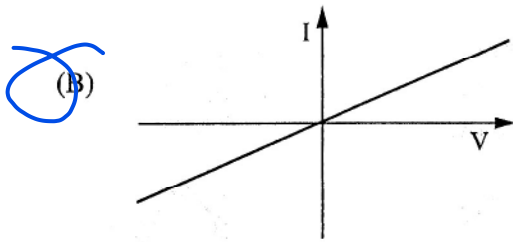
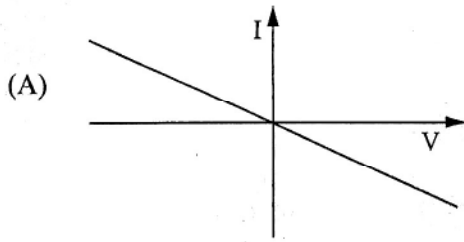
- (A) positively charged by gaining protons
- (B) negatively charged by gaining electrons
- (C) positively charged by gaining electrons
- (D) negatively charged by losing protons

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

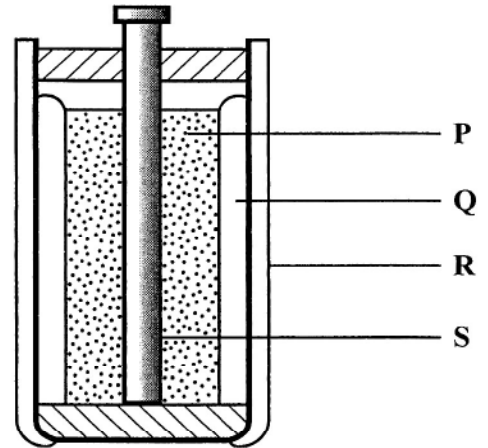
- I. In an insulator all electrons are bound firmly to their atoms.
- II. In an insulator many electrons can move freely from atom to atom.
- III. An insulator cannot be charged by rubbing.
- IV. A good insulator retains its charge better than a conductor.

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

41. Which of the following diagrams is a representation of the current/potential difference relationship for a metallic conductor at a constant temperature?



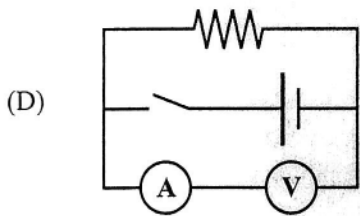
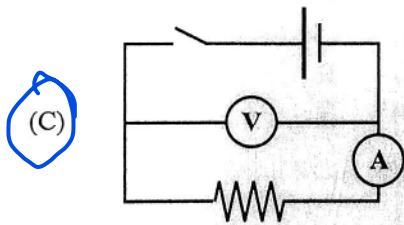
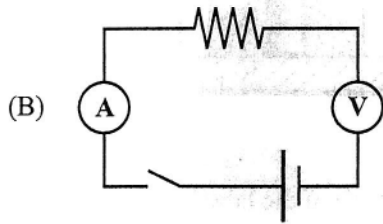
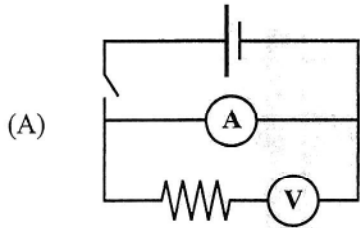
Item 42 refers to the following diagram which shows the cross section of a dry cell.



42. Which of the labelled parts is the electrolyte?

- (A) P
- (B) Q
- (C) R
- (D) S

43. A student requires a circuit to measure the resistance of a resistor. Which of the following circuits is correctly connected?



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

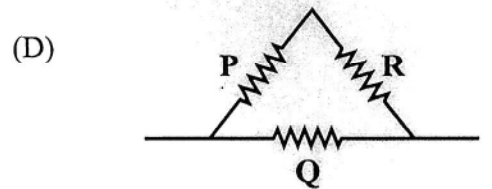
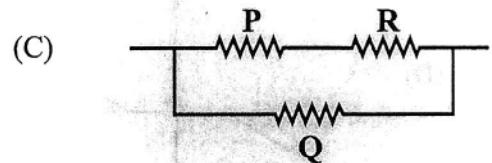
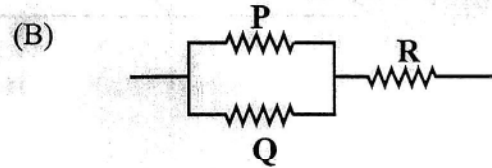
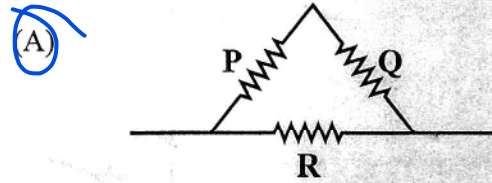
- (A) $\frac{1}{c}$
 (B) $\frac{90^\circ}{\sin c}$
 (C) $\frac{\sin 90^\circ}{\sin c}$
 (D) $\sin c$

45. In domestic installation systems, which of the following components should be placed in the live wire?

- I. Switches
 II. Circuit breakers
 III. Fuses

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

46. In which of the following diagrams are resistors P and Q in series with each other and parallel with R?



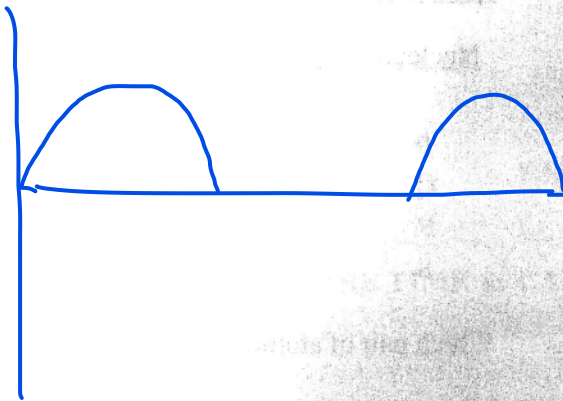
47. When a large current passes through a fuse, which of the following sequence of events is correct?

- (A) Wire gets hot → wire melts → current is cut off
- (B) Wire gets hot → current is cut off → wire melts
- (C) Wire melts → current is cut off → wire gets hot
- (D) Wire melts → wire gets hot → current is cut off

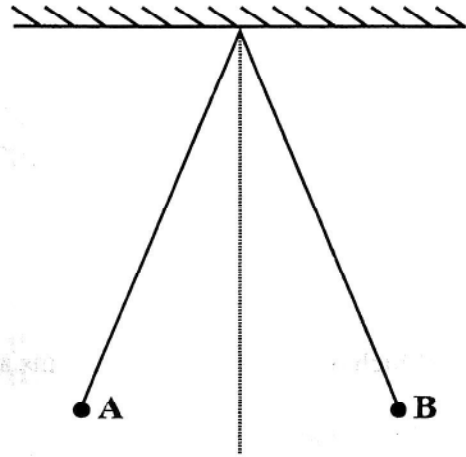
48. A semi-conductor diode produces half-wave rectification of alternating current. Which of the following statements is true?

- I. The current obtained has a constant value.
- II. The current obtained flows only in one direction.
- III. There are periods when no current flows from the source.

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



Item 49 refers to the following diagram.



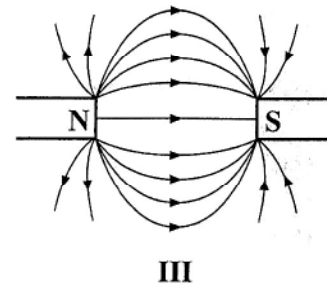
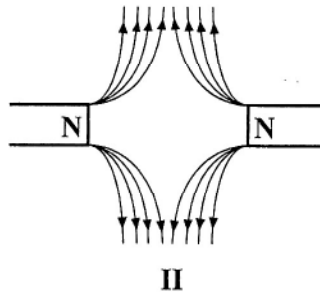
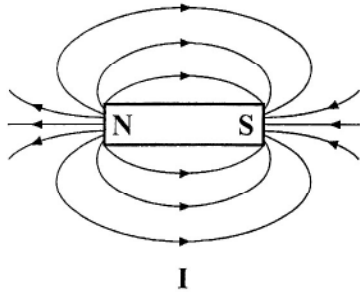
49. Two light aluminium spheres, A and B, are suspended by insulating threads. If they come to rest as shown in the diagram, the force keeping them apart is

- (A) gravitational
- (B) electrostatic
- (C) magnetic
- (D) centripetal

50. Which of the following statements about alternating current is true?

- (A) It can be changed into direct current by a transformer.
- (B) It can be rectified by using a semiconductor diode.
- (C) It can be used to recharge a battery.
- (D) It is used to transmit electrical energy because of its high frequency.

51. The following diagrams show the magnetic field lines plotted by a student.



Which of the following diagrams are correct?

- (A) I and II only
 (B) I and III only
 (C) II and III only
 (D) I, II and III
-
52. A transformer is used to
- (A) alter the voltage
 (B) alter the frequency
 (C) convert direct current to alternating current
 (D) convert alternating current to direct current
53. Rectification can BEST be done by using a
- (A) transformer
 (B) diode
 (C) transistor
 (D) capacitor
54. Which of the following is four times the mass of a proton?
- (A) Alpha particle
 (B) Beta particle
 (C) Electron
 (D) Neutron
55. J.J. Thompson discovered the electron. Which of the following physicists discovered the proton?
- (A) Thompson
 (B) Bohr
 (C) Chadwick
 (D) Rutherford
- Items 56–57 refer to the following information.
- | Nucleus | Neutron Number | Proton Number |
|---------|----------------|---------------|
| P | 126 | 82 |
| Q | 126 | 83 |
| R | 125 | 82 |
| S | 146 | 92 |
56. Which pair of atomic nuclei are isotopes?
- (A) P and Q
 (B) Q and R
 (C) P and R
 (D) Q and S

GO ON TO THE NEXT PAGE

57. Which two elements could occupy adjacent positions in the periodic table?

- (A) P and Q
- (B) P and R
- (C) Q and S
- (D) R and S

58. Which of the following scientists discovered radium?

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

59. 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

60. Which of the following statements concerning an α -particle are true?

- I. It has twice the charge of a proton.
- II. It has twice the mass of a proton.
- III. It has the same sign charge as a proton.

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

END OF TEST

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

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 2014099

MAY/JUNE 2014

**CARIBBEAN EXAMINATIONS COUNCIL
CARIBBEAN SECONDARY EDUCATION CERTIFICATE®
EXAMINATION**

PHYSICS

Paper 01 – General Proficiency

1 hour 15 minutes

05 JUNE 2014 (a.m.)

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

Sample Answer



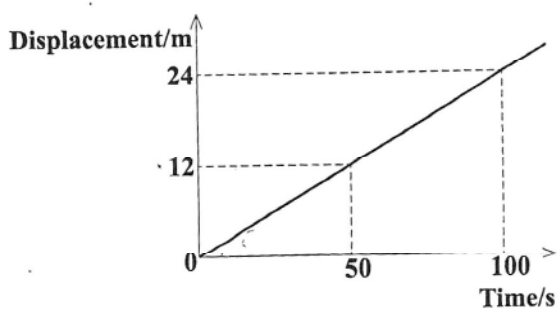
The best answer to this item is “metre” so answer space (B) has been shaded.

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 this item later. Your score will be the total number of correct answers.
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.

1. When used in front of a unit the prefix, 'mega' means
- (A) 10^{-6}
 - (B) 10^3
 - (C) 10^3
 - (D) 10^6
2. If force = mass \times acceleration, the unit of force could be written
- (A) $\text{kg}^{-1} \text{m s}^2$
 - (B) $\text{kg m}^{-1} \text{s}^2$
 - (C) $\text{kg m}^{-1} \text{s}^{-2}$
 - (D) kg m s^{-2}
3. The base unit of temperature of the S.I. system is the
- (A) Celsius
 - (B) Fahrenheit
 - (C) Kelvin
 - (D) Centigrade
4. Which of the following pairs consist(s) of fundamental quantities?
- I. Mass and weight
 - II. Mass and length
 - III. Time and current
- (A) I only
 - (B) II only
 - (C) I and III only
 - (D) II and III only
5. The time period of a simple pendulum oscillating with a small amplitude depends on the
- (A) mass of the pendulum bob
 - (B) amplitude of the oscillation
 - (C) length of the pendulum
 - (D) force with which the pendulum is set into motion
6. Which of the following quantities is defined in terms of SI units?
- (A) Current
 - (B) Charge
 - (C) Length
 - (D) Temperature
7. Which of the following measurements has THREE significant figures?
- (A) 0.0293 kg
 - (B) 0.94 A
 - (C) 5.321 V
 - (D) 10.42 m
8. The newton-metre is the unit used to measure
- (A) force
 - (B) power
 - (C) momentum
 - (D) moment of a force
9. Two forces of 8 N and 10 N CANNOT give a resultant of
- (A) 1 N
 - (B) 2 N
 - (C) 9 N
 - (D) 18 N

Item 10 refers to the following graph.



10. The graph above shows how the displacement of a runner from a starting line varies with time. This runner is

- (A) not moving
- (B) going at a steady speed
- (C) going faster and faster
- (D) going slower and slower

11. A body moving with a constant acceleration has applied to it

- (A) a constant force
- (B) a decreasing force
- (C) an increasing force
- (D) a resultant zero force

12. Two smooth spheres, A and B, collide head on. Which of the following statements is/are TRUE?

- I. The momentum of A is the same after collision as it was before.
- II. The momentum of B is the same after collision as it was before.
- III. The total momentum of A and B is the same after collision as it was before.

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

13. A hydroelectric power station uses a renewable source of energy, X. This energy raises water to the top of a mountain so that it has gravitational potential energy. As the water runs down the mountain, it turns a turbine which converts Y energy into Z energy. Which set of answers for X, Y and Z is correct?

	X	Y	Z
(A)	Electrical	potential	kinetic
<input checked="" type="radio"/> (B)	Solar	kinetic	electrical
(C)	Geothermal	potential	electrical
(D)	Chemical	kinetic	electrical

14. 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 velocity 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}

15. On which of the following features does the pressure at a point in a liquid depend?

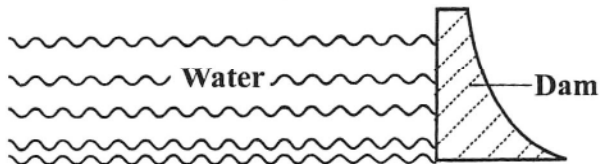
- I. Density of the liquid
- II. Depth from the surface
- III. Area of the cross section of the container

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

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

- I. Claw hammer
 - II. Crowbar
 - III. Pair of tweezers
 - IV. Pair of wire cutters
- (A) I and IV only
(B) III and IV only
(C) I, II and III only
(D) I, II and IV only

Item 17 refers to the following diagram which shows a dam.



17. The pressure on the dam at the bottom of the reservoir depends on the

- (A) depth of the water
(B) volume of water held by the dam
(C) mass of water held back by the dam
(D) length of the reservoir

18. A piece of string is tied onto a small stone and the stone is then suspended, 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

19. Which of the following would explain why an ordinary 0–110°C laboratory thermometer is NOT used to measure human body temperature?

- I. The reading would change when the thermometer is taken from the patient's mouth.
 - II. It is not sensitive enough to measure small changes in temperature.
 - III. It does not have a large enough range.
- (A) I only
(B) I and II only
(C) II and III only
(D) I, II and III

20. Which of the following is the MOST suitable range 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

21. In which of the following is conduction the MAIN method of energy transfer?

- (A) Food heated in a microwave oven
(B) Energy transferred from the sun to earth
(C) Food being cooked on a barbecue grill
(D) Food being cooked in a pot on an electric stove

22. When illuminated smoke is viewed through a microscope, small, bright specks can be seen moving in a jerky haphazard manner. These specks are

- (A) atoms
(B) molecules
(C) smoke particles
(D) light particles

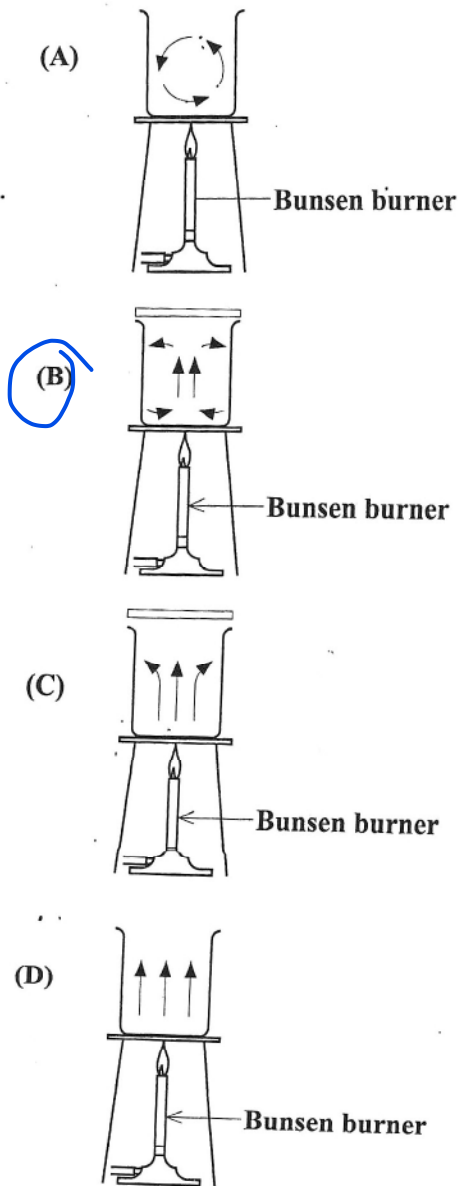
23. Most refrigerators are painted white because a white surface is

- (A) easily cleaned
- (B) a good reflector of thermal radiation
- (C) a good absorber of radiation
- (D) a poor reflector of radiation

25. The heat from a nearby fire reaches us MAINLY by

- (A) conduction
- (B) convection
- (C) absorption
- (D) radiation

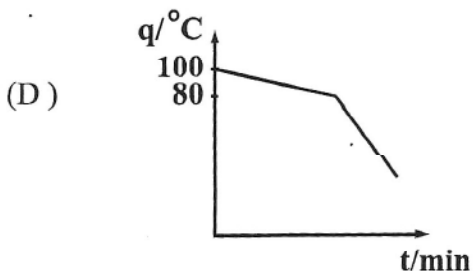
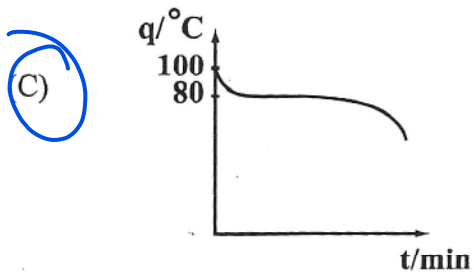
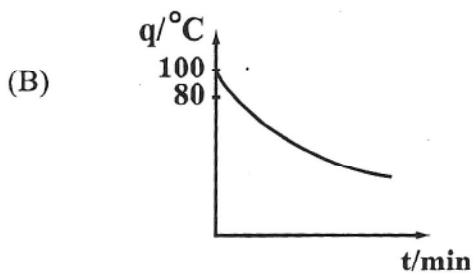
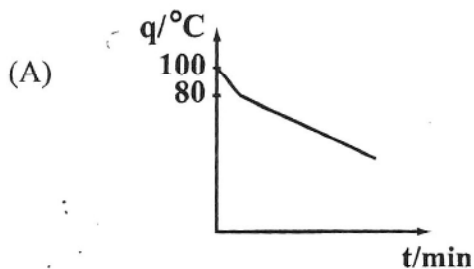
24. Which of the following diagrams BEST illustrates convection current in a liquid?



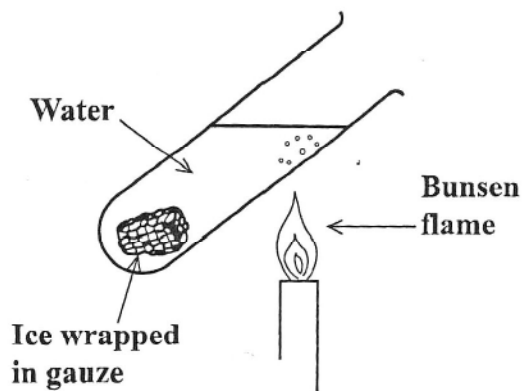
26. A flask contains air under pressure. Some of the air is let out slowly over a period of 10 seconds. When the flask is closed the

- (A) pressure of the air in the flask will have increased
- (B) volume of air in the flask will have decreased
- (C) temperature in the flask will have increased
- (D) number of molecules striking the wall per second will have decreased

27. Some molten naphthalene at 100 °C is allowed to cool down to room temperature. If naphthalene has a melting point of 80 °C, which of the following graphs BEST represents the cooling curve?



Item 28 refers to the diagram below which shows water boiling at the top of a glass test tube while a piece of ice remains unmelted at the bottom.



28. Which of the following statements is the reason for this occurrence?

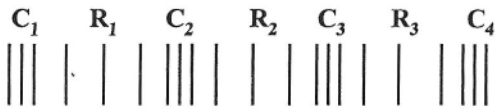
- (A) Water is a poor conductor of heat.
 (B) Gauze is a poor conductor of heat.
 (C) Water is a good conductor of heat.
 (D) Glass is a good conductor of heat.

29. Which of the following waves travel(s) only as longitudinal waves?

- I. Sound
 II. Radio
 III. Water

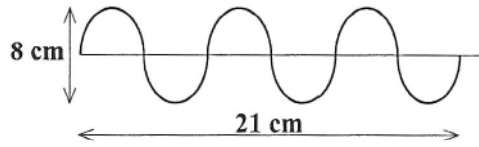
- (A) I only
 (B) II only
 (C) II and III only
 (D) I, II and III

Item 30 refers to the following diagram which shows a longitudinal wave, where, C and R represent compressions and rarefactions respectively.



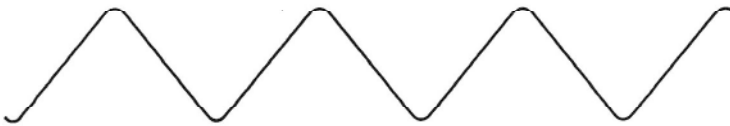
30. If λ = wavelength, the distance between C_1 and R_2 is
- (A) $\frac{1}{2} \lambda$
 - (B) 1λ
 - (C) $1 \frac{1}{2} \lambda$
 - (D) 2λ

Item 31 refers to the following diagram.



31. The diagram above illustrates the side view of a water wave. The amplitude of the wave is
- (A) 4 cm
 - (B) 7 cm
 - (C) 8 cm
 - (D) 21 cm

Item 32 refers to the following diagram.



32. The figure above shows the profile of a water wave. Using the same scale, which diagram below represents a wave twice the frequency and half the amplitude in the same tank of water?

- (A)
- (B)
- (C)
- (D)

33. Which of the following statements provides a reason why the diffraction of light is NOT usually observed?

- (A) Its wavelength is too small.
- (B) Its frequency is too high.
- (C) Its speed is too high.
- (D) Its wavelength is too large.

34. On which of the following would the position of an image formed by a plane mirror depend?

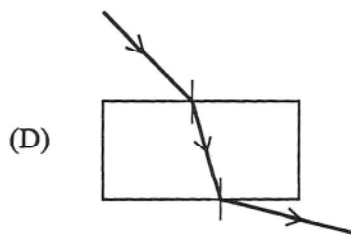
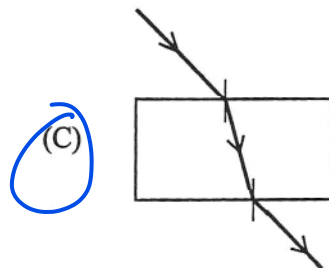
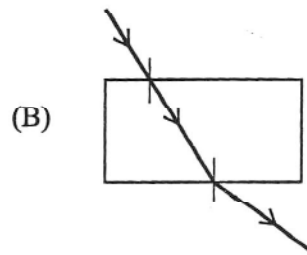
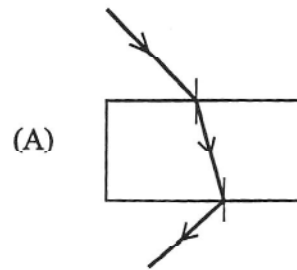
- (A) Distance of the observer from the mirror
- (B) Distance of the object from the mirror
- (C) Angle at which the image is viewed
- (D) Angle at which the object is viewed

35. Which of the following can produce a diminished virtual image of a real object?

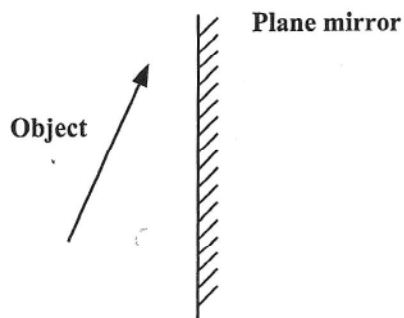
- I. A plane mirror
- II. A diverging lens
- III. A converging lens

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

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



Item 37 refers to the following diagram.



37. The diagram above represents an object placed in front of a plane mirror. Which of the following BEST represents the image produced by the plane mirror?

- (A)
- (B)
- (C)
- (D)

38. Which of the following statements about waves is TRUE?

- (A) Only transverse waves undergo reflection.
- (B) Longitudinal waves do not undergo refraction, but may be reflected.
- (C) Diffraction can only take place with light waves.
- (D) All waves undergo reflection, refraction and diffraction.

39. An echo is quieter than the original sound that produced it. This shows that, compared to the original sound, the echo has a

- (A) smaller amplitude
- (B) shorter wavelength
- (C) lower frequency
- (D) slower speed

40. Which of the following electromagnetic waves has the SHORTEST wavelength?

- (A) Gamma rays
- (B) Infrared waves
- (C) Radio waves
- (D) Ultraviolet radiation

41. Which of the following objects can detect X-rays?

- (A) Thermometers
- (B) Photographic film
- (C) Oscilloscopes
- (D) Television aerials

42. Which of the following is NOT one of the ways in which the strength of the magnetic field near a solenoid (long coil) carrying a current can be increased?

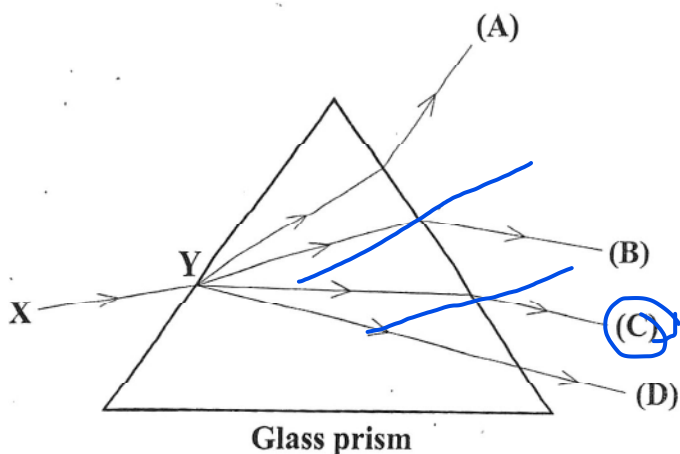
- (A) Increasing the resistance of the coil
- (B) Increasing the current in the coil
- (C) Increasing the number of turns per unit length of the coil
- (D) Placing a soft iron core inside the coil

43. Which of the following statements is/are TRUE about the image formed by a plane mirror?

- I. It is virtual.
- II. It is laterally inverted.
- III. It is magnified.

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

44. Which of the labelled paths, A, B, C or D in the diagram below, is correct for the ray XY?



45. Total internal reflection in glass occurs when

- (A) the angle of incidence is 90°
- (B) the critical angle is exceeded
- (C) all the light is transmitted
- (D) the incident ray is perpendicular to the glass boundary

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

- (A)
- (B)
- (C)
- (D)

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

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

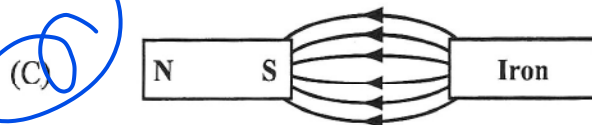
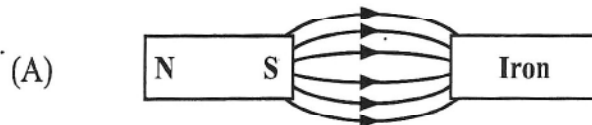
48. Which of the following materials is MOST suitable for the core of an electromagnet?

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

49. Which of the following pairs of statements is true for BOTH iron and steel?

	Iron	Steel
(A)	easily magnetised	does not retain its magnetism
(B)	not easily magnetised	retains its magnetism well
(C)	easily magnetised	retains its magnetism well
(D)	not easily magnetised	does not retain its magnetism

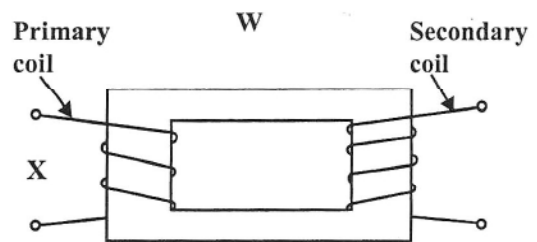
50. Which of the following shows the magnetic field between a bar magnet and a piece of iron?



51. Steel is NOT suitable for use in an electromagnet because it

- (A) is too difficult to magnetise
- (B) retains magnetism too well
- (C) loses its magnetism too easily
- (D) contains too many domains

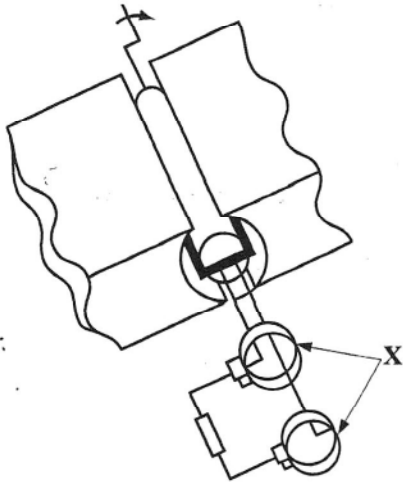
Item 52 refers to the following diagram.



52. Appropriate labels for W and X would be

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

Item 53 refers to the following diagram of a simple a.c. generator.



53. The parts labelled X in the diagram are known as the

- (A) coils
- (B) armatures
- (C) commutators
- (D) slip rings

54. Which of the following is TRUE when a magnet is moved relative to a coil?

- I. The induced current is in the same direction as the charge causing it.
- II. The greater the number of turns of coil the smaller the induced e.m.f.
- III. The faster the magnet moves relative to the coil the greater the induced e.m.f.
- IV. The stronger the magnetic field the greater the induced e.m.f.

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

55. Which of the following is TRUE for the relative charges on the neutron, proton and the electron?

	Relative charge on neutron	Relative charge on proton	Relative charge on electron
<input checked="" type="radio"/> (A)	0	+1	-1
(B)	+1	0	-1
(C)	+1	-1	0
(D)	0	+1	0

Items 56–57 refer to the following table.

Nuclei	Atomic Mass	Neutron Number
P	16	8
Q	13	9
R	18	10
S	21	11

56. Which element follows ${}^7_3\text{Li}$ in the Periodic Table?

- (A) P
- (B) Q
- (C) R
- (D) S

57. The nuclide ${}^{234}_{90}\text{Th}$ 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 symbols would be possible for an isotope of nuclide presented by ${}^A_Z\text{X}$?



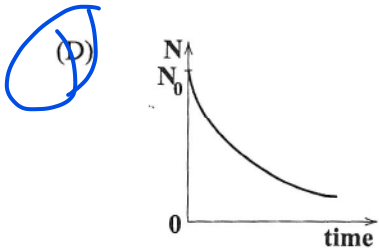
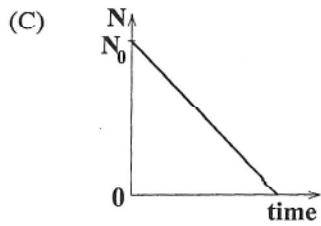
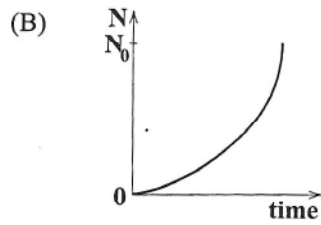
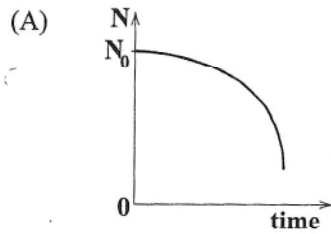
- (A) I only
- (B) II only
- (C) III only
- (D) I and III only

59. Which of the following scientists is associated with the relationship $E = mc^2$?

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

60. N_0 radioactive nuclei are present in a sample at time $t = 0$.

Which of the following graphs BEST represents the variation with time of the number, N , of undecayed nuclei present?



END OF TEST

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