

**EDUCATIONAL ASSESSMENT AND EXAMINATION SERVICE (EAES)**  
**ETHIOPIAN SECONDARY SCHOOL LEAVING CERTIFICATE EXAMINATION**  
**(ESSLCE) PHYSICS**

File Vector

**BOOKLET CODE: 088**  
**NUMBER OF ITEMS: 50**

**SUBJECT CODE: 04**  
**TIME ALLOWED: 2 HOURS**

**GENERAL DIRECTIONS**

THIS BOOKLET CONTAINS **PHYSICS** EXAMINATION. THE SUBJECT CODE FOR THIS EXAMINATION IS **04** AND THE CODE FOR THIS PARTICULAR BOOKLET IS **088**. PLEASE COPY THESE CODES ON YOUR ANSWER SHEET WHERE IT READS **BOOKLET CODE** AND **SUBJECT CODE**. THEN, BLACKEN THE CORRESPONDING BOXES IN THE COLUMNS BELOW EACH NUMBER.

IN THIS EXAMINATION, THERE ARE A TOTAL OF **50 MULTIPLE CHOICE ITEMS**. ATTEMPT ALL THE ITEMS. FOLLOW THE INSTRUCTIONS ON THE ANSWER SHEET AND THE EXAMINATION PAPER CAREFULLY. USE ONLY **PENCIL** TO MARK YOUR ANSWERS.

THERE IS ONLY **ONE BEST** ANSWER FOR EACH ITEM. CHOOSE THE BEST ANSWER FROM THE SUGGESTED OPTIONS AND BLACKEN THE LETTER OF YOUR CHOICE ON THE ANSWER SHEET. YOUR ANSWER MARK SHOULD BE **HEAVY AND DARK**, COVERING THE ANSWER SPACE COMPLETELY. PLEASE ERASE ALL UNNECESSARY MARKS COMPLETELY FROM YOUR ANSWER SHEETS.

YOU WILL BE ALLOWED TO WORK FOR **2 HOURS**. IF YOU FINISH BEFORE TIME IS CALLED, YOU MAY GO BACK AND REVIEW. WHEN TIME IS CALLED, YOU MUST IMMEDIATELY STOP WORKING, LAY YOUR PENCIL DOWN, AND WAIT FOR FURTHER INSTRUCTIONS.

ANY FORM OF CHEATING OR AN ATTEMPT TO CHEAT IN THE EXAMINATION HALL WILL RESULT IN AN AUTOMATIC DISMISSAL FROM THE EXAMINATION HALL AND CANCELLATION OF YOUR SCORE(S).

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

**EDUCATIONAL ASSESSMENT AND EXAMINATION SERVICE (EAES)**  
**ETHIOPIAN SECONDARY SCHOOL LEAVING CERTIFICATE EXAMINATION (ESSLCE)**  
**PHYSICS**

**BOOKLET CODE: 088**  
**Number of Items: 50**

**SUBJECT CODE: 04**  
**Time Allowed: 2 hours**

You may refer to the information given below when you need to work on some of the questions.

| Name of constants                      | Symbol       | Value                                           |
|----------------------------------------|--------------|-------------------------------------------------|
| Acceleration due to gravity            | $g$          | $10 \text{ m/s}^2$                              |
| Mass of proton                         | $m_p$        | $1.67 \times 10^{-27} \text{ kg}$               |
| The charge of electron                 | $e^-$        | $1.6 \times 10^{-19} \text{ C}$                 |
| Universal gravitational constant       | $G$          | $6.67 \times 10^{-11} \text{ Nm}^2/\text{kg}^2$ |
| Density of water                       | $\rho$       | $1000 \text{ kg/m}^3$                           |
| Molar gas constant                     | $R$          | $8.314 \text{ J/mol.K}$                         |
| permittivity of vacuum                 | $\epsilon_0$ | $8.85 \times 10^{-12} \text{ F/m}$              |
| Magnetic permeability of free space    | $\mu_0$      | $4\pi \times 10^{-7} \text{ Tm/A}$              |
| Coulomb's constant                     | $k$          | $9 \times 10^9 \text{ Nm}^2/\text{C}^2$         |
| $\sin 30^\circ = \cos 60^\circ = 0.5$  |              |                                                 |
| $\cos 30^\circ = \sin 60^\circ = 0.87$ |              |                                                 |
| $\sin 37^\circ = \cos 53^\circ = 0.6$  |              |                                                 |
| $\cos 37^\circ = \sin 53^\circ = 0.8$  |              |                                                 |
| $\sin 90^\circ = 1$                    |              |                                                 |
| $\cos 90^\circ = 0$                    |              |                                                 |

BOOKLET CODE: 088

SUBJECT CODE: 04

- (1.) In physics, dynamics is understood as a branch of mechanics which describes the motion of particles
- A. without considering the effects of forces.
  - ☒ B. together with the effects of forces.
  - C. on which only a constant resultant force is applied.
  - D. on which no resultant force is applied.
2. After doing a background research, a researcher formulates a hypothesis. If the researcher proceeds with his/her study following the scientific method, which one of the following is the correct ordering of the steps the researcher should follow?
- A. Design an experiment → Make predictions → Analyze the collected data → Draw conclusions
  - B. Design an experiment → Analyze the collected data → Make predictions → Draw conclusions
  - C. Analyze the collected data → Make predictions → Design an experiment → Draw conclusions
  - ☒ D. Make predictions → Design an experiment → Analyze the collected data → Draw conclusions
3. Among the following concepts of physics, which one of the following is commonly used in analyzing forces on the bridge, motion of airplane, motion of planets and magnetic fields?
- A. kinematics
  - B. Thermodynamics
  - ☒ C. Vectors
  - D. Optics

BOOKLET CODE: 088

SUBJECT CODE: 04

4. In a certain class student A measured the acceleration due to gravity, while student B measured electric current in a circuit. Each student did the measurement four times. Two readings of student A are below the accepted value, while the other two are above the accepted value. On the other hand, all the readings of student B are below the accepted value. Which one of the following is correct about the types of errors associated with the two experiments?

- ☒ A. Systematic error to experiment done by B  
B. Systematic error to experiment done by A  
C. Random error to experiment done by B  
D. Both systematic and random errors to experiments done by both A and B

5. The instantaneous acceleration of a particle is the

- A. change of position divided by the total time taken for the change to take place.  
☒ B. rate change of velocity in a very short time interval that approaches zero.  
C. average velocity in a very short time interval that approaches zero.  
☒ D. change of velocity divided by the total time taken for the change to take place.

BOOKLET CODE: 088

SUBJECT CODE: 04

6. Consider two objects A and B; object A undergoes a uniform circular motion while object B performs a non-uniform circular motion. Which one of the following is correct about the motions of the two objects?
- A. The velocities and accelerations of both objects are perpendicular to each other.
  - ☒ B. the velocity of object A is constant whereas the velocity of object B is not.
  - C. Both objects have constant accelerations.
  - D. the speed of object A is constant whereas the speed of object B is not.
7. The unit vector in the direction of vector  $\vec{A}$  is  $\frac{1}{3}(2\hat{i} + \hat{j} - 2\hat{k})$ . If  $\vec{A}$  has the same magnitude as vector  $\vec{B} = (3\hat{i} - 4\hat{j})$ , then what is vector  $\vec{A}$ ?
- A.  $\vec{A} = (2\hat{i} + \hat{j} - 2\hat{k})$
  - ☒ C.  $\vec{A} = \frac{1}{3}(10\hat{i} + 5\hat{j} - 10\hat{k})$
  - B.  $\vec{A} = (10\hat{i} + 5\hat{j} - 10\hat{k})$
  - D.  $\vec{A} = \frac{1}{5}(3\hat{i} - 4\hat{j})$
8. Vector  $\vec{A}$  has a magnitude of 30 units and points in the positive x direction. When a second vector  $\vec{B}$  is added to  $\vec{A}$  their resultant  $\vec{R} = \vec{A} + \vec{B}$  has a magnitude of 15 units in the negative x direction. The magnitude and direction of vector  $\vec{B}$  must be
- ☒ A. 45 units in the direction of negative x.
  - B. 15 units in the direction of negative x.
  - C. 45 units in the direction of positive x.
  - D. 15 units in the direction of positive x.
9. A car travelling in straight line decelerates uniformly from a speed of 60 m/s to zero in 12 seconds. What distance does it travel during this time?
- A. 1,080 m
  - C. 690 m
  - B. 720 m
  - ☒ D. 360 m

BOOKLET CODE: 088

SUBJECT CODE: 04

10. A car is moving due east with a speed of 15 m/s and at the same time a motorcycle is moving due north at a constant speed of 20 m/s. What is the velocity of the car relative to the motorcycle?
- ~~A.~~ 25 m/s at  $53^\circ$  North of east  
 B. 5 m/s at  $37^\circ$  North of east  
 C. 25 m/s at  $53^\circ$  south of east  
 D. 5 m/s at  $37^\circ$  south of east
11. A torque applied on a body is  *$\tau = \text{positive energy}$*
- A. a vector quantity and has similar dimension with that of a force.  
B. the vector product of an applied force and the position vector from the pivot point to the point of application of the force.  
 C. the scalar product of an applied force and the position vector from the pivot point to the point of application of the force.  
 D. a scalar quantity and has similar dimension with that of energy or work.
12. A ball of mass  $m$  moving with a velocity  $\vec{v}_1$  collides with a wall and rebounds with a velocity  $\vec{v}_2$ . During the collision, it is subjected to an average force of  $\vec{F}$  over a time interval  $\Delta t$ . The impulse delivered to the ball during the collision is
- A.  $\vec{I} = m(\vec{v}_1 + \vec{v}_2)$ .  
 B.  $\vec{I} = m\left(\frac{\vec{v}_2 - \vec{v}_1}{\Delta t}\right)$ .  
 C.  $\vec{I} = \frac{\vec{F}}{\Delta t}$ .  
~~D.~~  $\vec{I} = \vec{F}(\Delta t)$ .

BOOKLET CODE: 088

13. Which one of the following is true about energy, work and force?
- A. Work, energy and force have the same dimension.
  - B. A person carrying 100 kg object and moving horizontally is doing work without expending energy
  - ☒ C. A force is a vector quantity and different in dimension from that of both work and energy which are scalars.
  - D. The work done on an object is the product of an applied force and the displacement it produces, and is a vector quantity.
14. When a constant force is applied horizontally on an object of mass  $m$  placed on a horizontal frictionless surface, its velocity is changed from an initial velocity  $v_1$  to a final velocity  $v_2$ . The mechanical work done by the force is
- ☒ A.  $\frac{1}{2} m(v_2^2 - v_1^2)$ .
  - B.  $\frac{1}{2} m(v_2^2 + v_1^2)$ .
  - C.  $\frac{1}{2} m(v_2 - v_1)^2$ .
  - D.  $\frac{1}{2} m(v_2 + v_1)^2$ .
15. An object is thrown vertically upward and after reaching maximum height, it falls down to the point it was thrown. If there is a considerable air resistance of a medium, which one of the following is correct about energies associated to the object?
- ☒ A. Mechanical energy of the object is constant throughout its path.
  - B. There is work done by gravity when the object returns back to the point it was thrown.
  - C. The kinetic energy of the object at the point of throw is equal to its potential energy at its maximum height.
  - D. Work done by air resistance is equal to the loss of kinetic energy of the object in the round trip.

**SUBJECT CODE: 04**

- ## Physics

BOOKLET CODE: 088

20. Three dogs named A, B, and C are quarreling on a bone and pulling it apart in three different directions in air. Assume that the weight of the bone is negligible compared to the forces exerted on it by the dogs, and the forces are lying in the xy plane. Dog A is pulling with 26 N force along a direction that makes  $53^\circ$  to the north of positive x axis, Dog B is pulling with  $F_B$  force along the negative x direction, and Dog C is pulling with  $F_C$  force along the negative y direction. If the bone is in static equilibrium, the magnitudes of the forces that Dogs B and C have applied are
- ☒ A.  $F_B = 20.8 \text{ N}$  and  $F_C = 15.6 \text{ N}$   
B.  $F_B = 15.6 \text{ N}$  and  $F_C = 20.8 \text{ N}$   
C.  $F_B = 10.0 \text{ N}$  and  $F_C = 24.0 \text{ N}$   
D.  $F_B = 24.0$  and  $F_C = 10.0 \text{ N}$
21. For a particle in a gas at high temperature the rms speed is the
- ☐ A. arithmetic mean of all the speeds of the particles.  
☐ B. average value of the squares of the speeds of the particles.  
☐ C. square root of the mean of all the squares of the speeds of the particles.  
☒ D. square root of the mean of all speeds of the particles.
22. Consider a heat engine consisting of gas as its working substance. Which of the following processes does **NOT** occur during the operation of the engine?
- ☒ A. absorption of heat energy by the gas from a low-temperature reservoir  
B. the working substance doing work on its surroundings  
C. absorption of heat energy by the gas from a high-temperature reservoir  
D. expulsion of energy by heat engine to a lower-temperature reservoir

120 031  
43C 45B  
44B 46A

9

**BOOKLET CODE: 088**

**SUBJECT CODE: 04**

23. Which one of the following statements is correct about the states of equilibrium of a bottle placed on a horizontal surface?

- ☒ A. A bottle lying on its side is in a stable equilibrium because small torque acting on it will cause it to move but stops when it is removed.
- B. A bottle standing upright is in a neutral equilibrium because small torque acting on it will cause its center of mass to lie inside a point vertically above its base.
- ☒ C. A bottle standing on its neck is in unstable equilibrium because a small torque acting on it will cause its center of mass to lie outside a point vertically above its neck.
- D. A bottle lying on its side is in an unstable equilibrium because a small torque acting on it will cause it to roll over the surface.

45  
24. Surface tension is defined as

- ☒ A. a cohesive effect at the surface of a liquid due to the forces between atoms or molecules of the liquid.
- B. a cohesive effect at a point inside a liquid due to the forces between atoms or molecules of the liquid.
- C. an adhesive effect at the contact surfaces between a container and a liquid due to the forces between atoms or molecules of the liquid and that of the container.
- D. a cohesive effect at the contact surfaces between a container and a liquid due to the forces between atoms or molecules of the container.

BOOKLET CODE: 088

25. The height  $h$  with which a liquid rises in a liquid column due to capillary action is
- ☒ A. inversely proportional to the radius of the tube.
  - ☐ B. directly proportional to the density of the liquid.
  - ☐ C. inversely proportional to the liquid-air surface tension.
  - ☐ D. directly proportional to the sine of the contact angle between the liquid and tube.
26. Which one of the following statements is correct about the rate of heat flow in metallic bar through conduction? The rate of heat flow is
- ☐ A. inversely proportional to the cross-sectional area of the bar.
  - ☒ B. directly proportional to the temperature gradient along the bar.
  - ☐ C. directly proportional to the square of the cross-sectional area of the bar.
  - ☐ D. inversely proportional to the square of the length of the bar.
27. An ideal fluid is pumped through a long inflexible pipe of uniform cross-section of 10 cm in diameter. If  $3140 \text{ m}^3$  of this fluid is pumped per day, what is the speed of the fluid in the pipe?
- ☐ A. 111.11 m/s
  - ☒ B. 0.04 m/s
  - ☐ C. 1.16 m/s
  - ☐ D. 4.63 m/s
28. A wall of a house has surface area  $1.2 \text{ m}^2$  and thickness of  $\Delta x$ . The wall is made of an insulating material of thermal conductivity  $0.02 \text{ W/m } ^\circ\text{C}$ , and is used as a boundary that separates the inside and outside of the house. If heat flows through the wall at the rate of 10 watt and maintains a temperature difference of  $15 ^\circ\text{C}$  between the outside and inside of the house, the thickness of the wall is
- ☐ A. 36 cm.
  - ☐ B. 27 cm.
  - ☐ C. 3.6 cm.
  - ☐ D. 40 m.

BOOKLET CODE: 088

SUBJECT CODE: 04

29. An ideal gas is compressed from an initial volume of 12.0 liters to a final volume of 4.0 liters at a constant pressure of 1.2 atm. What is the total work done on the gas? ( $1 \text{ atm} = 1.013 \times 10^5 \text{ Pa}$  and  $1 \text{ liter} = 10^{-3} \text{ m}^3$ )

A. 486.2 J

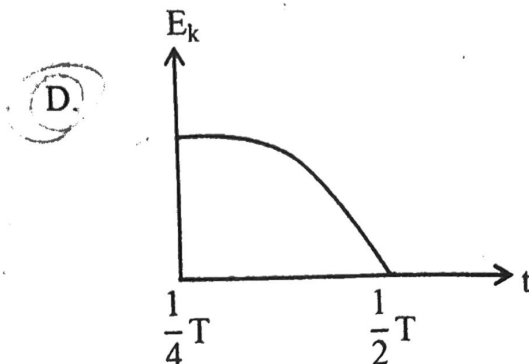
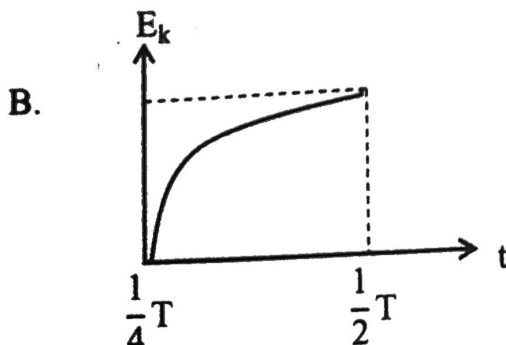
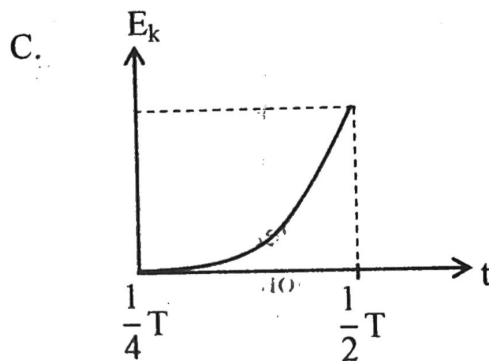
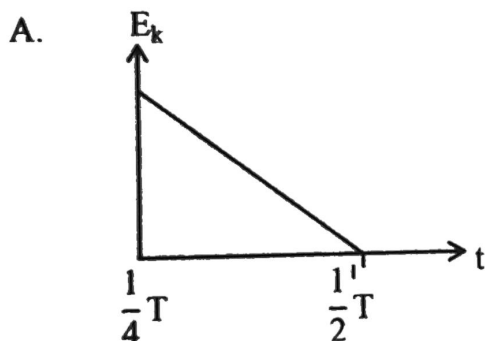
C. 1,945.0 J

B. 972.5 J

D. 1,458.7 J

30

- A particle of mass  $m$  is undergoing simple harmonic motion with a period  $T$  and amplitude  $A$ . The particle is at its maximum displacement at the initial time  $t = 0$ . Which one of the following graph correctly represent the variation of the kinetic energy of the particle during the time interval between  $t = \frac{1}{4} T$  and  $t = \frac{1}{2} T$ ?



BOOKLET CODE: 088

SUBJECT CODE: 04

31. Gauss's law states that (40)
- A. the electric flux through any closed surface is directly proportional to the charge contained inside the surface.
  - ☒ B. the electric flux through a closed surface is zero when a nonzero net charge is enclosed by the surface.
  - C. the electric flux through any closed surface is inversely proportional to the charge contained inside the surface.
  - D. the electric flux through a closed surface is a nonzero constant when the net charge enclosed by the surface is zero. (3)
32. Which of the following is true about the electric field of a charged conductor? The electric field Electric charges
- A. just outside a charged conductor is different from zero and parallel to the surface of the conductor.
  - B. inside an isolated conductor is different from zero if the conductor carries a charge but zero if the conductor is neutral.
  - ☒ C. just outside a charged conductor is different from zero and perpendicular to the surface of the conductor. Electric field
  - D. Inside an isolated conductor is different from zero whether or not the conductor carries a charge or neutral.
33. A sound wave with a frequency  $f$  from a stationary source reaches a listener with a frequency Sound
- A. less than  $f$  if the listener is also stationary.
  - ☒ B. less than  $f$  if the listener is moving away from the source.
  - C. greater than  $f$  if the listener is moving away from the source.
  - D. equal to  $f$  if the listener is moving away from the source.

BOOKLET CODE: 088

SUBJECT CODE: 04

34. A dielectric placed in an external electric field
- A. forms an electric field in it in the opposite direction of the external field due to induced polarization in the molecules.
  - ☒ B. forms an electric field in it in the same direction of the external field due to induced polarization in the molecules.
  - C. contains dipoles which are randomly oriented.
  - D. contains partially aligned dipoles with the external electric field whose alignment decreases when the external electric field increases.
35. A cord of 0.5 m long is fixed at both ends. If a standing wave is formed by a wave travelling with a speed of  $250 \frac{m}{s}$ , what is the fundamental frequency of vibrating cord?
- A. 500.0 Hz
  - B. 62.5 Hz
  - C. 125.0 Hz
  - ☒ D. 250.0 Hz
36. In a Young's double slits experiment, when an adjustable double slit is illuminated with a monochromatic light a diffraction pattern is produced on a viewing screen. Which one of the following is correct about the width of the pattern produced on the screen? The width of the diffraction pattern
- A. decreases if the distance between the slits and the viewing screen is increased.
  - ☒ B. increases if the wavelength of the light source illuminating the slits is increased.
  - C. increases if the distance between the two slits is increased.
  - D. is independent of the both wavelength of the light and slit distance.

0.5m  
 $\frac{250m}{s}$

BOOKLET CODE: 088

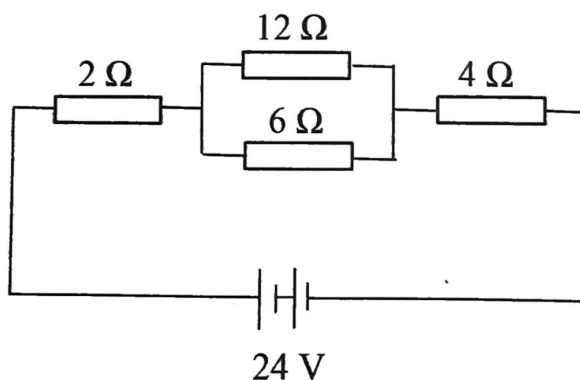
37. In young's double slit experiment, a viewing screen is separated from a double slit by 4.5 m. The distance between the two slits is 0.04 mm. If a monochromatic light of wavelength 560 nm is directed toward the double slit and forms an interference pattern on the screen, the distance between adjacent dark fringes will be

A. 3.15 cm. C. 6.30 cm.  
B. 9.45 cm. D. 12.6 cm.

38. A test charge of magnitude 2 nC is initially placed at a distance of 8 cm from another point charge of 5  $\mu\text{C}$ . If the test charge is moved 6cm towards the 5  $\mu\text{C}$  charge, what is the change in its electric potential energy?

A.  $3.375 \times 10^{-3} \text{ J}$  C. 33.75 J  
B.  $6.750 \times 10^5 \text{ J}$  D.  $6.750 \times 10^4 \text{ J}$

39. Consider the combination of four resistors of resistances 2  $\Omega$ , 4  $\Omega$ , 6  $\Omega$ , and 12  $\Omega$  connected with a battery of potential difference 24 V, as shown in the diagram.



What is the potential difference across the 6  $\Omega$  resistor?

A. 14.4 V C. 4.8 V  
B. 24 V D. 9.6 V

BOOKLET CODE: 088

SUBJECT CODE: 04

40. A galvanometer can be modified and converted into
- A. a voltmeter by adding a large resistance in parallel with that of the galvanometer.
  - ☒ B. an ammeter by adding a low resistance in parallel to the resistance of the galvanometer.
  - C. an ammeter by adding a small resistance in series with that of the galvanometer.
  - D. a voltmeter by adding a small resistance in parallel to that of the galvanometer.
41. When placed in an applied magnetic field,
- A. both paramagnetic and diamagnetic materials show a tendency that opposes the applied magnetic field.
  - B. both paramagnetic and diamagnetic materials show a tendency that reinforces the applied magnetic field.
  - ☒ C. a paramagnetic material shows a tendency that reinforces the applied magnetic field in contrast to the diamagnetic one which opposes the applied magnetic field.
  - D. a paramagnetic material shows a tendency that opposes the applied magnetic field in contrast to the diamagnetic one that reinforces the applied magnetic field.
42. The process in which two light nuclei combine to form a heavier nucleus is called
- A. nuclear fission
  - ☒ B. nuclear fusion
  - C. nuclear reaction
  - D. binding energy

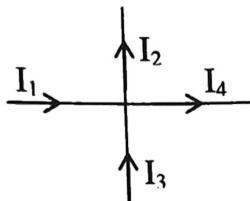
BOOKLET CODE: 088

43. When electrons from an electron gun are accelerated through a vacuum towards a layer of graphite a circular diffraction pattern is observed. The occurrence of this phenomenon shows
- ☒ A. wave properties of particles.
  - B. particle properties of electrons.
  - C. wave properties of light.
  - D. particle properties of waves.
44. Consider a piece of copper tube of 1 m long, piece of a magnet, and a piece of nonmagnetic metal of the same size as the magnet. The magnet and nonmagnetic substances are dropped simultaneously and allowed to fall through the tube. Which of the following is correct about the times required by the two substances to fall through the length of the tube?
- A. Both the magnet and nonmagnetic substance take equal time to reach the bottom of the tube because the only force acting on both is the gravitational force.
  - ☒ B. The magnet takes shorter time than the nonmagnetic substance because the magnet induces a magnetic field in the tube that speeds up motion.
  - C. The magnet takes longer time than the nonmagnetic substance because the magnet induces a magnetic field in the tube that slows its motion.
  - D. The magnet takes shorter time than the nonmagnetic substance because the drag force on the magnet is larger than that on the nonmagnetic substance.

BOOKLET CODE: 088

SUBJECT CODE: 04

45. A portion of a circuit depicting one of the junctions in which currents are entering or leaving the junction is shown in the diagram given below. (the arrows represent the direction of the currents).



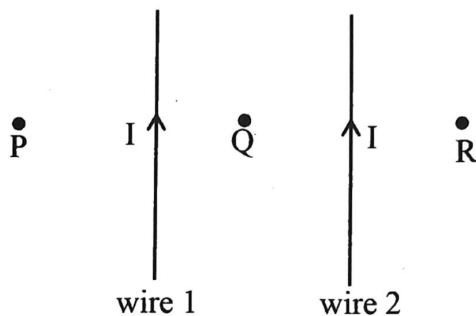
Which of the following is correct regarding the sign of the currents according to the sign convention for currents?

- A.  $I_1$  is negative  
B.  $I_3$  is positive  
C.  $I_2$  is positive  
D.  $I_4$  is positive
46. A proton is moving perpendicular to the magnetic and electric fields in a velocity selector which is operating with a magnetic field of 2.5 T and an electric field of 5.0 kV/m. What is the speed of the proton?
- A.  $5.0 \times 10^4$  m/s  
B.  $2.0 \times 10^4$  m/s  
C.  $5.0 \times 10^3$  m/s  
D.  $2.0 \times 10^3$  m/s

BOOKLET CODE: 088

SUBJECT CODE: 04

47. Consider two parallel long straight conductors carrying equal current  $I$  along the positive  $y$  direction as shown in bellow.



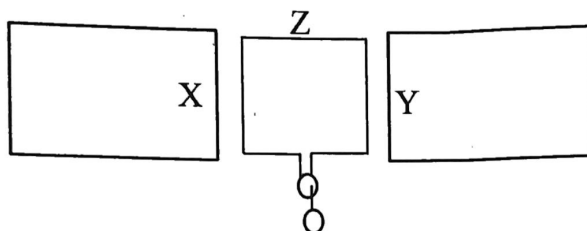
The net magnetic field due to the two current carrying conductors is

- ☒ A. zero at a point midway between the conductors.
- ☐ B. in the direction of the currents in the region between the two wires (at point Q)
- ☐ C. directed out of the page of the paper at point R
- ☐ D. directed in to the page of the paper at point P.

BOOKLET CODE: 088

SUBJECT CODE: 04

48. Suppose the figure shown below represents the schematic diagram of an a.c. generator depicting its main components.

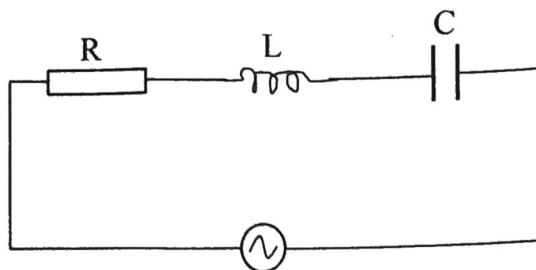


Which one of the following is correct about the a.c. generator?

- A. Both X and Y represents the North poles of two bar magnets.
- B. Both X and Y represents the South poles of two bar magnets.
- C. Z represents a rectangular coil made of insulators.
- ☒ D. Z represents a rectangular coil made of conductors.

BOOKLET CODE: 088

49. Consider a series RLC circuit that consists of a resistor  $R = 200 \, \Omega$ , an inductor  $L = 0.5 \, \text{H}$ , a capacitor  $C = 4 \, \mu\text{F}$ , and an a.c. source of frequency  $f = 60 \, \text{Hz}$  (with maximum voltage  $V_{\text{rms}} = 100 \, \text{V}$ ), as shown in the diagram.



$$f = 60 \, \text{Hz},$$

$$V_{\text{max}} = 100 \, \text{V}$$

Which one of the following is correct about the parameters of the circuit?

- A. The phase angle of the circuit is  $-76^\circ$ .  
~~B.~~ The reactance of the capacitor is  $663.5 \, \Omega$ .  
 C. The resonant frequency of the circuit is  $159 \, \text{Hz}$ .  
 D. The current lags behind the applied voltage.
50. If the isotope carbon-14 is radioactive and has a half-life of 5775 years, the decay constant of this sample will be (use  $\ln 2 = 0.693$ )
- A.  $8.3 \times 10^3/\text{year}$       ~~C.~~  $1.2 \times 10^{-4}/\text{year}$   
 B.  $1.2 \times 10^{-1}/\text{year}$       D.  $4.0 \times 10^3/\text{year}$

# The End