PAPER III

Answer all questions.

Each question is followed by five options lettered A to E. Choose the correct option for each question and shade in pencil on your answer sheet the answer space that bears the same letter as the option you have chosen. Give only one answer to each question and erase completely any answer you wish to change. Do all rough work on this question paper.

An example is shown below:

A capacitor of charge 7.5×10^{-4} C has a potential of 50 V. What is its capacitance?

A. $6.7 \times 10^{-15}\ \mu F$
B. $1.4 \times 10^{-9}\ \mu F$
C. $1.5 \times 10^{-4}\ \mu F$
D. $7.5 \times 10^{-2}\ \mu F$
E. $3.8 \times 10^{-1}\ \mu F$

The correct option is "$1.5 \times 10^{-4}\ \mu F$" which is lettered C. Therefore, answer space C would be shaded as shown below:

[A] [B] [C] [D] [E]

1. A boy travelled from point Q to R along a winding road. The space between Q and R is

A. acceleration.
B. displacement.
C. distance.
D. speed.
E. velocity.

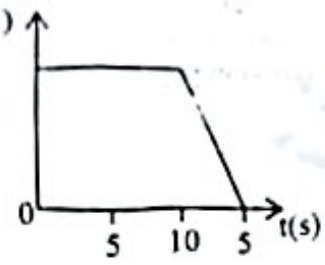
2. Which of the following forces is not a field force?

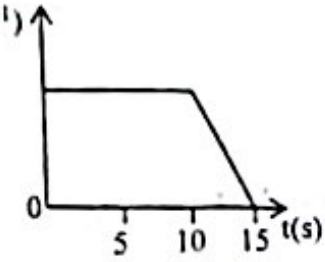
A. Electric
B. Electromagnetic
C. Gravitational
D. Magnetic
E. Tensional

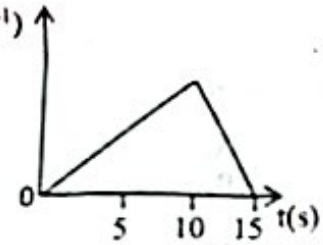
3. The slope of a distance-time graph represents

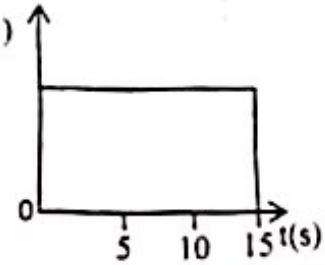
A. acceleration.
B. distance covered.
C. speed.
D. time taken.
E. velocity.

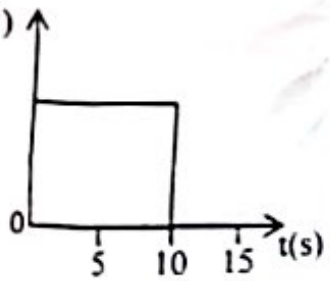
4. A car moved with constant velocity for 10 s and then decelerates to rest in 5 s. Which of the graphs below represents its motion?

A.


B.


C.


D.


E.


5. Two perpendicular forces of magnitudes 3 N and 5 N act on an object. Calculate the magnitude of their resultant.

A. 1.4 N
B. 2.0 N
C. 4.0 N
D. 5.8 N
E. 8.0 N

6. A car accelerates uniformly from rest and covers a distance of 500 m in 20 s, calculate the magnitude of its acceleration.

A. 1.3 ms^{-2}
B. 2.5 ms^{-2}
C. 5.0 ms^{-2}
D. 25.0 ms^{-2}
E. 50.0 ms^{-2}

7. **Figure 3.1** represents a force F acting at point S.

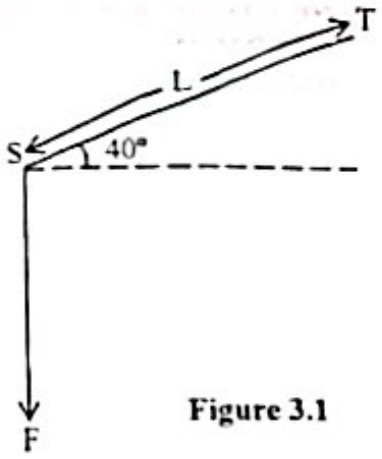


Figure 3.1

The magnitude of the moment of the force about the point T is

A. $\frac{F}{L \sin 40^\circ}$
B. $\frac{F}{L \cos 40^\circ}$
C. FL *sin* 40.
D. FL *cos* 40.
E. FL *tan* 40.

29. Two tuning forks of frequencies 256 Hz and 512 Hz are sounded in an experiment. What is the difference in wavelengths of the notes produced?
[Speed of sound in air = 330 ms^{-1}]

A. 0.09 m
B. 0.43 m
C. 0.56 m
D. 0.64 m
E. 0.78 m

30. Two men standing near a cliff, clap their hands separately and heard their corresponding echoes 2.0 s and 2.5 s later. Calculate the difference in their distances from the cliff.
[Speed of sound in air = 340 ms^{-1}]

A. 765 m
B. 425 m
C. 340 m
D. 170 m
E. 85 m

31. Gravitational and magnetic fields are denoted by lines of force that are

A. circular.
B. imaginary.
C. intersecting.
D. perpendicular.
E. vertical.

32. The force of attraction between two bodies of equal mass m is F. If the gravitational constant is G, the expression for the distance between them is

A. $\frac{Gm^2}{F}$.
B. $m\sqrt{\frac{F}{G}}$.
C. $m^2\sqrt{\frac{G}{F}}$.
D. $\sqrt{\frac{Gm}{F}}$.
E. $\sqrt{\frac{Gm^2}{F}}$.

33. Which of the following statements is not correct about electric lines of force? They

A. are continuous.
B. are uniformly spaced in a uniform field.
C. indicate the direction of the electric field.
D. intersect one another.
E. start only on positive charges.

34. Two resistors of resistance 10 Ω each are connected in parallel to a 12 V supply. Calculate the magnitude of the current passing through the circuit.

A. 0.8 A
B. 1.2 A
C. 2.4 A
D. 22.0 A
E. 120.0 A

35. Three capacitors of capacitance C, 3 C and 5 C are arranged in series. The effective capacitance of the capacitors is expressed as

A. 9 C.
B. $\frac{23}{15\,C}$.
C. $\frac{15\,C}{23}$.
D. $\frac{9}{15\,C}$.
E. $\frac{1}{9\,C}$.

36. At what angle to a magnetic field should a charged particle be projected to experience the greatest force?

A. 120°
B. 90°
C. 60°
D. 45°
E. 0°

37. A transformer is to supply 130 V from a 220 V source. If the number of turns in the primary coil is 440, calculate the number of turns required in the secondary coil.

A. 33
B. 65
C. 75
D. 260
E. 405

38. The working of a moving coil ammeter can be explained by

I Fleming's left hand rule.
II Faraday's law of electromagnetic induction.
III Lenz's law.

Which of the above statement(s) is/are correct?

A. I only
B. II only
C. III only
D. I and II only
E. II and III only

39. An inductor of 3 H connected across an a.c. source has a reactance of 942 Ω. Determine the frequency of the source.
[$\pi = 3.14$]

A. 25 Hz
B. 40 Hz
C. 50 Hz
D. 60 Hz
E. 100 Hz

40. A heater of 150 Ω is connected to an a.c. source. If a root mean square current of 2.2 A passes through it, calculate the power dissipated.

A. 68 W
B. 330 W
C. 495 W
D. 726 W
E. 1452 W

15. The length of a metal rod changed from 12.6 m to 13.0 m when its temperature changed by 50°C. Calculate its linear expansivity.

A. $6.35 \times 10^{-4}\ K^{-1}$
B. $6.15 \times 10^{-4}\ K^{-1}$
C. $4.06 \times 10^{-2}\ K^{-1}$
D. $2.16 \times 10^{-2}\ K^{-1}$
E. $2.00 \times 10^{-2}\ K^{-1}$

16. The ice and steam points of an unmarked thermometer are 10 cm and 90 cm respectively. If the level of the mercury thread is 20 cm below the steam point, calculate the temperature in degree celsius.

A. 12.5
B. 45.5
C. 60.0
D. 70.0
E. 75.0

17. A substance of mass 0.3 kg underwent a temperature change of 20 K when heat of 2.52×10^4 J was supplied to it. Calculate its specific heat capacity.

A. $2.4 \times 10^{-4}\ Jkg^{-1}K^{-1}$
B. $4.0 \times 10^{3}\ Jkg^{-1}K^{-1}$
C. $4.2 \times 10^{3}\ Jkg^{-1}K^{-1}$
D. $2.5 \times 10^{4}\ Jkg^{-1}K^{-1}$
E. $1.5 \times 10^{5}\ Jkg^{-1}K^{-1}$

18. 6180 g of ice at 0°C changed to water at the same temperature. Calculate the quantity of heat absorbed.
[Latent heat of fusion of ice = $3.36 \times 10^5\ Jkg^{-1}$]

A. 1.83×10^{-5} J
B. 1.84×10^{-2} J
C. 5.40×10^{1} J
D. 2.07×10^{3} J
E. 2.08×10^{6} J

19. One litre vessel is filled with gas at a temperature of 80°C and a pressure of 45 cmHg. If the gas is cooled to a temperature of 30°C while the volume is reduced by half, calculate the new pressure.

A. 26.21 cmHg
B. 38.63 cmHg
C. 33.75 cmHg
D. 77.25 cmHg
E. 104.85 cmHg

20. The following are the processes involved in charging a body positively by induction:

I Bring a negatively charged body near the body to be charged
II Remove the negatively charged body
III Touch the body being charged
IV Remove the finger

The correct sequence is

A. I, II, III and IV.
B. I, III, II and IV.
C. I, III, IV and II.
D. II, I, III and IV.
E. III, IV, I and II.

8 A bottom piece of copper of density 8.9×10^3 kgm^{-3} floats in a liquid of density 1.25×10^3 kgm^{-3}. Calculate the fraction of the volume of copper submerged in the liquid

A 0.14
B 0.86
C 6.12
D 7.12
E 8.12

9 A stone is projected at an angle of 30° to the horizontal and initial velocity of 40 ms^{-1}. Calculate its time of flight.
[g = 10 ms^{-2}]

A 2.0 s
B 3.5 s
C 4.0 s
D 20.0 s
E 40.0 s

10 A spring makes 30 revolutions in 5 s, calculate the frequency of the vibration.

A 0.17 Hz
B 5.00 Hz
C 6.00 Hz
D 25.00 Hz
E 150.00 Hz

11 A bulb glows when connected to a dry cell. This is an example of conversion of

A chemical energy to electrical energy
B chemical energy to light energy
C electrical energy to heat energy
D heat energy to chemical energy
E heat energy to electrical energy

12 A block and tackle system is used to raise a load of 230 N through a height of 18 m. If the work done against friction in the pulley is 500 J, calculate the total work done by the effort.

A. 3640 J
B. 4140 J
C. 4640 J
D. 8770 J
E. 9230 J

13. Which of the following situations **cannot** lead to energy crisis?

A. Fuel scarcity
B. Industrial strike
C. Political rally
D. Price hike of crude oil
E. Vandalisation of gas pipelines

14. A body of mass M moving at 40 ms^{-1} collided with a stationary body of mass N and both moved together with a common velocity V after collision. The expression for N in terms of the given parameters is

A. $\frac{40\,M}{V-40}$.

B. $\frac{M(40+V)}{V}$.

C. $\frac{M(40-1)}{V}$.

D. $\frac{M(40-V)}{V}$.

E. $\frac{VM}{40-V}$.

21. The distance between two successive crests of a wave is 0.3 m. If the speed of the wave is 1.5×10^4 ms^{-1}, calculate its frequency.

A. 2.0×10^{-5} Hz
B. 4.5×10^3 Hz
C. 1.2×10^4 Hz
D. 1.8×10^4 Hz
E. 5.0×10^4 Hz

22. The following activities generate waves:

I Disturbing a pool
II Plucking a string
III Releasing a compressed spring
IV Striking a tuning fork

Which of the waves produced is/are mechanical and transverse?

A. I only
B. II only
C. I and II only
D. I, II and III only
E. II, III and IV only

23. Which of the following is an example of a translucent object?

A. Glass
B. Metal sheet
C. Mirror
D. Tissue paper
E. Water

24. How many images will be formed by two plane mirrors inclined at an angle of 45° to each other?

A. 3
B. 4
C. 7
D. 8
E. 9

25. A liquid has a refractive index of 1.5. If the velocity of light in vacuum is 3.0×10^8 ms^{-1}, determine its velocity in the liquid.

A. 2.0×10^8 ms^{-1}
B. 2.5×10^8 ms^{-1}
C. 4.5×10^8 ms^{-1}
D. 1.5×10^9 ms^{-1}
E. 3.0×10^9 ms^{-1}

26. Which of the following is correct about gamma and ultraviolet rays? Both

A. are electromagnetic waves.
B. are longitudinal waves.
C. are mechanical waves.
D. can be detected by the human eyes.
E. penetrate lead block.

27. The parts of the human eye and simple camera that perform the same function are

A. cornea and lens.
B. iris and film.
C. lens and aperture.
D. pupil and diaphragm.
E. retina and film.

28. The following are materials through which sound travels; wood, water and steel. In which of the sets below are the materials arranged in order of decreasing velocity of sound?

A. Steel, wood and water
B. Water, steel and wood
C. Water, wood and steel
D. Wood, steel and water
E. Wood, water and steel

54. Sekere/Ichaka and Ogele are local musical instruments that

A. are made from calabash and beads.
B. are made from metal.
C. produce sound by vibration of air column.
D. produce sound when plucked.
E. produce sound when struck.

55. In a d.c. generator, the component that reverses the direction of flow of current is

A. armature.
B. carbon brushes.
C. commutator.
D. magnet.
E. slip rings.

56. Electricity gets to consumers from a generating station through

A. step-down transformer, distribution cables, step-up transformer and transmission cables.
B. step-down transformers, transmission cables, step-up transformer and distribution cables.
C. step-up transformer, distribution cables, step-down transformer and transmission cables.
D. step-up transformer, transmission cables, step-down transformer and distribution cables.
E. transmission cables, step-up transformer, distribution cables and step-down transformer.

57. A machine that is used to pull out nail from wood conveniently is

A. chisel.
B. claw hammer.
C. pliers.
D. screw driver.
E. spanner.

58. Shiroro dam is located in which state?

A. Benue
B. Kaduna
C. Kogi
D. Kwara
E. Niger

59. Artificial satellites are used in the following areas **except**

A. defence.
B. distant learning.
C. photography.
D. transportation.
E. weather forecast.

60. In which of the following areas is information from NigeriaSat-1 used?

A. Agriculture
B. Broadcasting
C. Internet
D. Telecommunication
E. Telepresence

47. A representation of fission reaction is given below:

$^{235}_{92}U + {}^{1}_{0}n \rightarrow {}^{147}_{57}La + {}^{85}_{y}Br + Z{}^{1}_{0}n + \text{energy}$

Determine the values of y and Z.

A. 32 and 1
B. 32 and 2
C. 32 and 3
D. 35 and 2
E. 35 and 3

48. In a model of hydrogen atom, the energy of a level

$$W_n = -\frac{P}{n^2},$$

where n is the energy level and P is a constant. Determine the energy released in the transition from $n = 4$ to $n = 3$.

A. $\frac{144}{7P}$
B. $\frac{144P}{7}$
C. $\frac{7P}{144}$
D. $\frac{144}{25P}$
E. $\frac{25P}{144}$

49. An atom radiates 2.32×10^{-15} J of energy when an electron drops from one energy level to another, calculate the frequency of the emitted radiation.
[$h = 6.6 \times 10^{-34}$ Js]

A. 4.28×10^{49} Hz
B. 3.52×10^{18} Hz
C. 2.85×10^{19} Hz
D. 1.53×10^{33} Hz
E. 8.92×10^{49} Hz

50. The uncertainty in the momentum of an atom is 1.23×10^{14} Ns. Calculate the uncertainty in the position of the atom.
[$h = 6.6 \times 10^{-34}$ Js]

A. 5.37×10^{-48} m
B. 7.83×10^{-48} m
C. 4.67×10^{-34} m
D. 1.86×10^{48} m
E. 8.12×10^{48} m

51. Milk is pasteurised by keeping its temperature at 162°F for 15 minutes. What is the temperature in celsius?

A. 130.0
B. 90.0
C. 76.4
D. 72.2
E. 61.3

52. A simple microscope and a telescope are

A. optical instruments.
B. reflecting devices.
C. used for magnifying objects.
D. used for viewing distant objects.
E. used for viewing microscopic objects.

53. In a compound microscope, the initial image is thrice the object size while the final image is five times the object size. Calculate the magnifying power of the microscope.

A. 0.6
B. 1.7
C. 2.0
D. 8.0
E. 15.0

41. Which of the following substances softens gradually with increasing temperature?

A. Aluminium
B. Diamond
C. Glass
D. Graphite
E. Quartz

42. A ball of mass m dropped in a liquid of viscosity v experienced an upthrust u and acceleration a. The expression for the mass of the ball in terms of the given parameter is [g = 10 ms^{-2}]

A. $\frac{a+u+v}{10}$.

B. $\frac{u+v}{10-a}$.

C. $\frac{u+v}{a-10}$.

D. $\frac{u+v}{10+a}$.

E. $\frac{u-v}{a-10}$.

43. Adhesion and cohesion are

I forces of attraction.
II surface forces.
III intermolecular forces.

Which of the statements above is/are correct?

A. I only
B. II only
C. III only
D. I and III only
E. I, II and III

44. The large angle scattering of particles by a metal foil was first observed by

A. Ernest Rutherford.
B. J. J. Thomson.
C. John Dalton.
D. Neils Bohr.
E. William Crookes.

45. A radioactive substance has an initial mass of 20 g and half-life of 5 days. Determine the time it would take 15 g of the atom to disintegrate.

A. 5 days
B. 10 days
C. 15 days
D. 20 days
E. 30 days

46. The following are radiations:

Gamma rays (γ)
Alpha particles (α)
Beta particles (β)

The arrangement in the increasing order of their ionisation power is

A. α, β and γ.
B. α, γ and β.
C. β, α and γ.
D. γ, α and β.
E. γ, β and α.