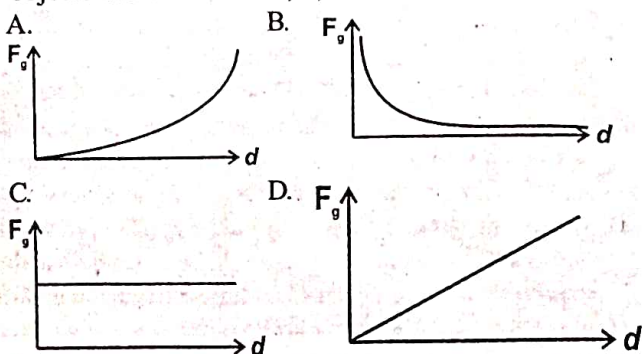


## WASSCE SC 2021 PHYSICS OBJECTIVE TEST 1

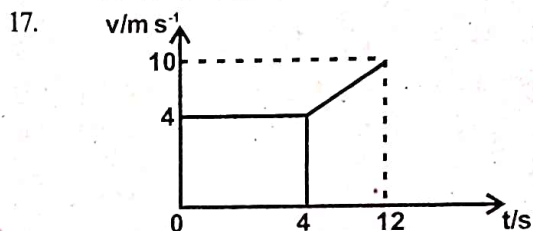
1. Which of the following quantities is **not** an example of force? A. Mass B. Tension C. Weight D. Friction
2. The reason for laminating the soft iron core of a transformer is to A. reduce eddy current. B. reduce the magnetic flux. C. increase the magnetic flux. D. reduce its efficiency.
3. Formation of hydrogen bubbles at the copper plate of a primary cell is called ... A. polarization. B. back *e.m.f.* C. electrolysis. D. local action.
4. Which of the following factors does not affect the rate of evaporation of a liquid? A. Temperature B. Volume C. Wind D. Surface area
5. The opening in the eye through which light passes to the retina is called the ... A. pupil. B. cornea. C. iris. D. optic nerve.
6. A heat sensitive resistor made of a semi-conductor is called a... A. thermometer. B. thermostat. C. thermistor. D. thermopile.
7. Electric motor **primarily** converts A. electric energy to chemical energy. B. kinetic energy to potential energy. C. electrical energy to mechanical energy. D. electrical energy to heat energy.
8. Which of the following statements about the molecules of solids and liquids is **correct**? They both A. have weak attraction. B. have wide separations. C. exhibit random motion. D. exhibit vibratory motion.
9. The distance between a node and its adjacent antinode of a transverse wave is equal to A. half of the wavelength. B. the wavelength. C. thrice the wavelength. D. quarter of the wavelength.
10. Which of the sketched graphs below illustrates the **correct** variation of the gravitational force,  $f_g$ , between two objects and the distance,  $d$ , between their centres?



11. Which of the following actions will **increase** the capacitance of a parallel plate capacitor? **I.** Decreasing the distance between the plates **II.** Increasing the distance between the plates **III.** Increase the area of the plates overlap **IV.** Avoiding the use of dielectric between the plates A. **I** and **II** only B. **II** and **III** only C. **I** and **IV** only D. **III** and **IV** only
12. A metallic sphere is heated from  $27^\circ\text{C}$  to  $200^\circ\text{C}$  without change of state. Which of the following changes would have resulted from the heating? A. No change occur in its volume and density B. Its volume increases and its density increases C. Its volume increases and density decreases D. Its volume increases without a change in density.
13. The acceleration of a moving object can be determined

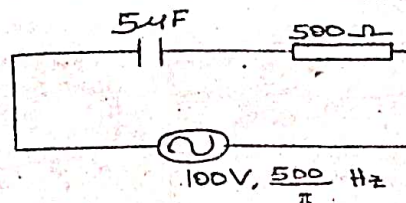
from the A. slope of its distance-time graph. B. area under its distance-time graph. C. slope of its velocity-time graph. D. area under its velocity-time graph.

14. A student wishes to measure the potential difference across a resistor,  $R$ . She has a galvanometer,  $G$  and some connecting wires, what else does she need? A. high value resistor connected in parallel with  $G$  B. low value resistor connected in parallel with  $G$  C. low value resistor connected in series with  $G$ . D. high value resistor connected in series with  $G$
15. The handle of a screw jack is 35cm long and the pitch of the screw is 0.5cm. What force must be applied at the end of the handle to lift a load of 2000N if the efficiency of the jack is 30%? [ $\pi = \frac{22}{7}$ ] A. 152.0N B. 132.0N C. 15.2N D. 440.0N
16. The inductive reactance in a circuit of frequency 100Hz is  $1\Omega$ . Calculate the inductance of the inductor. [ $\pi = 3.14$ ] A.  $2.00 \times 10^{-3}\text{H}$  B.  $1.59 \times 10^{-3}\text{H}$  C.  $1.09 \times 10^{-3}\text{H}$  D.  $6.28 \times 10^{-3}\text{H}$



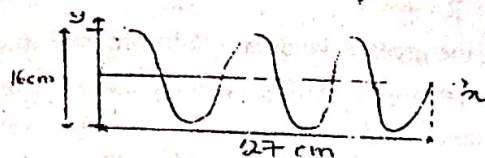
The diagram above illustrates the velocity-time graph of a body. Calculate the distance covered by the body during the motion. A. 15m B. 84m C. 72m D. 48m

18. An atom that emits an  $\alpha$  - particle A. may become a daughter of a different element. B. becomes a different isotope of the element. C. becomes a daughter with increased mass. D. becomes a daughter of a different element always.
19. Which of the following units is equivalent to the unit of electric current? A.  $\text{C s}^{-1}$  B.  $\text{W C}$  C.  $\text{J s}^{-1}$  D.  $\text{C}$
20. A ball is swung in a horizontal circle of centre  $O$  with a constant speed. What is the direction of its acceleration? A. Away from  $O$  B. Along the circumference of the circle C. Toward  $O$  D. Along a tangent to the circle
21. Which of the following statements is an effect of compressing gas molecules at constant temperature? A. The pressure on the molecules decreases. B. The molecules gain more kinetic energy. C. The molecules make more impact per second on the walls of the container. D. The molecules increase in size.



22. The diagram above is an illustration of an a.c. circuit. Calculate the reactance of the capacitor. A. 2016 $\Omega$  B. 2000 $\Omega$  C. 200 $\Omega$  D. 4000 $\Omega$
23. A current of 2A passes through a wire of resistance 4 $\Omega$  for 3 minutes. Calculate the energy lost. A. 980J B. 1440J C. 2880J D. 48J

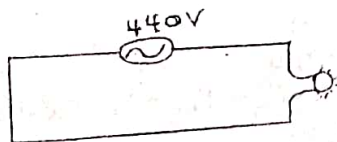
24. Which of the following statements about the universal gravitational constant,  $G$ , is true? A. It is a fundamental quantity. B. It has dimensions  $M^{-1}L^3T^{-2}$ . C. Its S.I. unit is  $Nm^2kg^{-1}$ . D. It is a vector quantity.



The sketched graph above represents a progressive wave moving from the left to the right. The period of the wave is 0.125 s.

Use the graph to answer questions 25 and 26

25. Determine the values of the amplitude and wavelength, respectively, of the wave. A. 8cm; 27cm B. 8cm ; 9 cm C. 4cm; 9cm D. 16cm; 27cm
26. Determine the speed of the wave. A.  $64\text{cms}^{-1}$  B.  $32\text{cm s}^{-1}$  C.  $24\text{cm s}^{-1}$  D.  $72\text{cm s}^{-1}$
27. Which of the following curved surfaces will produce a real image? I. Concave mirror II. Convex mirror III. Diverging lens IV. Converging lens A. I and II only B. I, II and IV only C. II, III and IV only D. I and IV only
28. The components of vectors  $Q$  and  $R$  are  $(-3.0, 5.5)$  and  $(9.2, 4.4)$ , respectively. Determine the components of  $Q + R$ . A.  $(3.7, 7.4)$  B.  $(6.2, 9.9)$  C.  $(2.5, -4.8)$  D.  $(12.7, 1.4)$
29. Which of the arrangements of radiations below shows decreasing order of wavelengths? A. X-rays > radio waves > infrared radiations B. Radio waves > infrared radiations > X-rays C. Infrared radiations > radio waves > X-rays D. X-ray > infrared radiations > radio waves
30. An electric pressing iron is connected to the mains using an insulated wire. After some minutes, the wire becomes very hot. The heat generated in the wire can be minimized by replacing the wire with one of A. thinner insulation. B. greater diameter. C. smaller diameter. D. thicker insulation



31. In the diagram above, a bulb is lit by drawing 2.0 A from 440V a.c. source. Calculate the cost of keeping the bulb on for two days at \$0.40 per kilowatt-hour. A. \$16.90 B. \$84.48 C. \$1690.00 D. \$8.48
32. A wire of cross-sectional area  $2\pi \times 10^{-8} \text{m}^2$  and resistivity  $1.1 \times 10^{-8} \Omega\text{m}$ , has a resistance of  $21 \Omega$ . Calculate the length of the wire. [ $\pi = \frac{22}{7}$ ] A. 180m B. 140m C. 120m D. 240m
33. Which of the following statements best describes the particles in a solid at room temperature? They are A. far apart and moving randomly. B. close together and vibrating C. close together and stationary D. close together and moving randomly.
34. A man weighing 200N runs up a staircase in 5s. If the height of the staircase is 9m, calculate the power of the man. A. 1000 W B. 360W C. 40W D. 1800W
35. A rotating disc contains a set of holes in a circle. An air jet is directed onto the holes and a note of frequency 480 Hz is produced. If the number of holes is 20, calculate the speed of rotation of the disc. A. 10 rev/s B. 20 rev/s C. 24 rev/s D. 8 rev/s
36. A force of 10N, acting continuously, increases the kinetic energy of an object from 20J to 60J. Find the distance moved by the object. A. 200m B. 40m C. 4m D. 400m
37. An electric circuit consists of a resistor, a battery and a key. If the voltage of the battery is increased, there would be an increase in the A. current and resistance only. B. current, resistance and temperature. C. current and temperature only. D. resistance and temperature only.
38. A radioactive material has a half life of 1.0 hour. If 200.0g of it was present at 6a.m on a certain day, how many grams will have decayed by 9a.m on the same day? A. 175.0g B. 150.0g C. 100.0g D. 187.5 g
39. The following statements about a loudspeaker are correct except A. it contains a permanent magnet. B. sound signal converted to varying current signals enter the speech coil. C. the current in the speech coil creates a magnetic force on the coil. D. the magnetic force on the speech coil is uni-directional.
40. An ice cube has mass of 20 g at  $5^\circ\text{C}$ . Calculate the energy required to raise its temperature to  $0^\circ\text{C}$  [Specific heat capacity of ice =  $2.1\text{J g}^{-1}\text{C}^{-1}$ ] A. 105J B. 100J C. 42J D. 210J
41. A stone is thrown horizontally with initial velocity  $15\text{ms}^{-1}$  from tower 20 m high. How long does it take to reach the ground? [ $g = 10\text{m s}^{-2}$ ] A. 2 s B. 4 s C. 5 s D. 1 s
42. Which of the following statements is not a characteristic of a plane progressive wave? A. Energy travels out through the medium B. Neighbouring points along the profile possess different amplitudes C. Neighbouring points along the profile possess the same amplitude D. Neighbouring particles vibrate with different phase
43. The electrons in a cathode-ray tube are produced by A. heating a metal filament. B. ionization of the air. C. applying a magnetic field to the y - plates. D. applying an electric field to the x-plates.
44. Which of the following statements about distance and displacement is not correct? A. Displacement is a vector quantity. B. Distance has dimension L. C. Displacement is measured in metres. D. Distance is a vector quantity.
45. A note produced by an instrument is distinguished from a similar note produced by another instrument by the .. A. intensity. B. pitch. C. overtones. D. loudness.
46. According to Pascal's principle, the pressure in a fluid is always A. dependent on density of the fluid. B. distributed partially in all directions. C. transmitted equally in all directions. D. increasing with height.
47. Which of the following sets of quantities have members which are all vectors? A. Pressure, energy and force B. Force, displacement and momentum C. Distance, acceleration and work D. Density, volume and weight
48. If the relative humidity of the atmosphere increases, the rate of evaporation of sweat from the human body A. decreases. B. remains the same. C. increases and then decreases. D. increases.
49. Which of the following factors is not among those that determine the resistance of a wire? Its A. mass B. cross-sectional area C. length D. material
50. Which of the following scientists suggested that moving particles exhibit wave properties? A. Isaac Newton B. Ernest Rutherford C. Louis de-Broglie D. J. J. thompson

## ANSWERS TO WASSCE SC 2021 PHYSICS OBJECTIVE TEST 1

1. A    2. A    3. A    4. B    5. A    6. C    7. C

8. D    9. D

10.  $F \propto \frac{m_1 m_2}{d^2}$                       Ans = B

11.  $C \propto \frac{A}{d}$                       implies:

Decreasing the distance between the plates will increase the capacitance C;

Increasing the area of the plates overlap will increase the capacitance C.                      Ans = A

12. C

13. Acceleration =  $\frac{\text{change in velocity}}{\text{change in time}}$                       Ans = C

14. D

15.  $VR = \frac{2\pi L}{P} = \frac{2 \times \frac{22}{7} \times 35}{0.5} = \frac{2 \times 22 \times 5}{0.5} = 440$

Using  $\xi = \frac{1}{E} \times \frac{1}{VR} \times 100\%$ , i.e.

$$30\% = \frac{2000}{E} \times \frac{1}{440} \times 100\%$$

$\therefore E = \frac{2000 \times 100}{30 \times 440} \approx 15.15 \dots \approx 15.2\text{N}$                       Ans = C

16. Inductive reactance,

$$X_L = 2\pi fL, \text{ i.e.}$$

$$1.0\Omega = 2 \times 3.14 \times 100 \times L$$

$$1.0 = 628L$$

$$\Rightarrow L = \frac{1.0}{628} \approx 1.59 \times 10^{-3}\text{H} \quad \text{Ans = B}$$

17. In the given diagram, distance covered by the body = area under the square + area under the trapezium

$$= 4 \times 4 + \frac{1}{2}(4 + 10) \times (12 - 4) = 16 + 7 \times 8 = 72\text{m} \quad \text{Ans = C}$$

18. D

19.  $Q = It \Rightarrow I = \frac{Q}{t}$  (having a unit of  $\text{Cs}^{-1}$ )                      Ans = A

20. C    21. C

22. Using the capacitive reactance,  $X_c = \frac{1}{2\pi fC}$

$$= \frac{1}{2\pi \times \frac{300}{\pi} \times 5 \times 10^{-6}} = \frac{1}{100 \times 5 \times 10^{-6}} = \frac{1}{5 \times 10^{-4}} = \frac{1}{5} \times \frac{1}{10^{-4}} = 0.2 \times 10^3$$

$$= 200\Omega \quad \text{Ans = C}$$

23. Energy lost,  $H = I^2 R t = 2 \times 2 \times 4 \times 3 \times 60 = 2880\text{J}$                       Ans = C

24. D

25.  $A = \frac{16}{2} = 8\text{cm}$  ;                       $\lambda = \frac{27}{3} = 9\text{cm}$                       Ans = B

26.  $V = f\lambda = \frac{1}{T} \times \lambda = \frac{9\text{cm}}{0.125} = 72\text{cms}^{-1}$                       Ans = D

27. D

$$28. \vec{OQ} = (-3\mathbf{i} + 5.5\mathbf{j})$$

$$\vec{OR} = (9.2\mathbf{i} + 4.4\mathbf{j})$$

$$\vec{OQ} + \vec{OR} = -3\mathbf{i} + 5.5\mathbf{j} + 9.2\mathbf{i} + 4.4\mathbf{j} = 6.2\mathbf{i} + 9.9\mathbf{j},$$

$$\text{i.e. } (6.2, 9.9) \quad \text{Ans = B}$$

29.  $\overset{\text{Longest}\lambda}{R} I V U X \overset{\text{Shortest}\lambda}{G}$                       Ans = B

30.  $p = \frac{RA}{L} \Rightarrow R = \frac{\rho L}{A}$

Meaning the greater the area, the lower the resistance.

But area,  $A = \pi(\frac{d}{2})^2$ ; so the greater the diameter, the lower the resistance, and vice versa.                      Ans = B

31. Electrical power used =  $IV = 2 \times 440 = 880\text{W}$

$$= \frac{880}{1000} \text{KW}$$

$$\text{Electrical power used in KWh} = \frac{880}{1000} \times 2 \times 24 = 42.24\text{KWh}$$

1KWh costs \$0.40

42.24KWh costs \$ x

$$\therefore x = \frac{42.24 \times 0.4}{1} = \$16.896 \approx \$16.90 \quad \text{Ans = A}$$

32.  $p = \frac{RA}{L} \Rightarrow L = \frac{RA}{p}$                        $\therefore L = \frac{21 \times 2\pi \times 10^4}{1.1 \times 10^4} = \frac{21 \times 2}{1.1} \times \frac{22}{7}$

$$= 120\text{m} \quad \text{Ans = C}$$

33. B

34. Power =  $\frac{\text{energy expended}}{\text{time}} = \frac{200 \times 9}{5} = 360\text{W}$                       Ans = B

35.

36. Change in K.E = work done, i.e.  $(60 - 20)\text{J} = F \times d$   
 $40\text{J} = 10 \times d$

$$\therefore d = \frac{40}{10} = 4\text{m} \quad \text{Ans = C}$$

37. From Ohm's law,  $V = IR$  (where R is a constant) Note that an increase in resistance would also cause an increase in temperature of the resistor.                      Ans = B

38. There are 3 hours between 6 a.m. and 9 a.m.

Number of activities,  $n = 3$

Mass of material remaining in the source after 3 activities  
 $= (\frac{1}{2})^3 \times 200\text{g} = \frac{1}{8} \times 200\text{g} = 25\text{g}$

Hence, the mass of the radioactive substance that will have decayed =  $200\text{g} - 25\text{g} = 175\text{g}$                       Ans = A

39. D

$$40. H = mc(\theta_2 - \theta_1)$$

$$= 20 \times 2.1 \times (0 - -5)$$

$$= 20 \times 2.1 \times 5 = 210\text{J}$$

Ans = D

41. Time taken for horizontal motion = the time taken to fall freely under g.

Thus using  $h = \frac{1}{2}gt^2$ , i.e.  $20 = \frac{1}{2} \times 10t^2$

$$\Rightarrow 20 = 5t^2$$

$$\Rightarrow t^2 = \frac{20}{5} = 4$$

$$\therefore t = \sqrt{4} = 2\text{s}$$

Ans = A

42. B    43. A

44. Distance is a scalar quantity.

Ans = D,

45. C    46. C    47. B    48. A    49. A    50. C

## WASSCE SC 2021 PHYSICS ESSAY 2