

SECTION I (Thirty five question) Question:

Direction: Each of the thirty five questions or incomplete statement in this section is following by four suggested answers.

Select the best answer in each case.

- 1) Which of the following physical quantities has as its base unit's $\text{kg m}^2 \text{s}^{-2}$?
 A. Pressure B. Energy C. Power D. Momentum.

- 2) Intensity defined as power per unit area which of the following is the units of intensity?

A	B	C	D
$\text{Kg m}^2 \text{s}^{-1}$	Kg s^{-3}	$\text{Kg m}^4 \text{s}^{-3}$	$\text{Kg}^2 \text{m}^2 \text{s}$

- 3) Which of the following is a base quantity in the S.I system?
 A. Electric current. B. Electric charge C. Force D. Specific charge.

- 4) Which of the following combinations has two vector quantities and one scalar quantity?

- A. Velocity, acceleration, moment B. Deceleration, volume, amplitude
 C. Wavelength, momentum, pulsance D. Moment of force, momentum, speed

- 5) The velocity of a car is \vec{V}_B . if the velocity of car A relative to car B is 20 ms^{-2} , it means that

- A. $\vec{V}_B = \vec{V}_A - 20 \text{ ms}^{-1}$ B. $\vec{V}_B = 20 \vec{V}_A$ C. $\vec{V}_A = \vec{V}_B - 20 \text{ ms}^{-1}$ D. $\vec{V}_A = 20 \vec{V}_B$

- 6) the magnitude of the acceleration an object moving along a straight line is equal to the

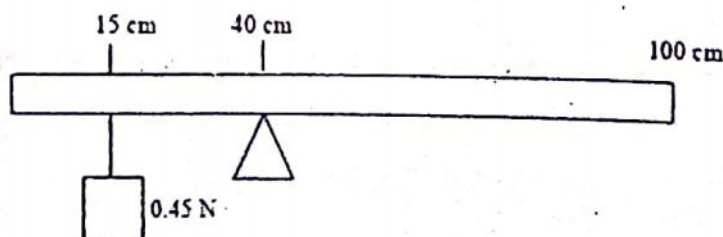
- A. slope of its displacement – time graph B. area below its force – time graph
 C. slope its velocity – time graph D. area under its velocity – time graph

- 7) Two students Ngwa and Ngwese are engaged in a tug-of-war. Each one pulls as hard as possible on his own end of the tow rope, in order to pull his opponent across the winning line. Ngwese wins. this is because:

- A. His pull on Ngwa is greater than the pull of Ngwa on him.
 B. They pull on each other with the same force but Ngwese is more steady than Ngwa;
 C. Ngwese is able to grip the rope more firmly than Ngwa;
 D. The net force in the rope acts towards Ngwese. Hence Ngwa moves towards him.

- 8) A uniform metre rule is supported on a knife edge placed at the 40.0 cm mark. A weight of 0.45N suspended at the 15.0 cm mark balances the metre rule horizontally.

Figure 1



The weight of the metre rule is:

- A. 1.13 N B. 50.0 N C. 0.50 N D. 0.75 N.

- 9) Near the shore a fisherman jumps out of his boat with a velocity of 5.00 ms^{-1} and lands on the shore 0.650 s afterwards. The respective masses of the fisherman and boat are 85.0 kg and 165 kg and the frictional force between the boat and the water is negligible. What will be the distance between the fisherman and the shore?

A. 3.25 m

B. 1.67 m

C. 4.93 m

D. 5.00 m

- 11) If the engine of a car of mass m is capable delivering power P , the minimum time needed for the car to accelerate from rest to a speed v is:

A. Mv^2/P B. $P/(mv)$ C. $2P/(mv^2)$ D. $(mv^2)/2P$

- 12) At the instant the bob of oscillating simple pendulum reaches the equilibrium position, its displacement is zero. Which of the following statements correctly describes the kinetic energy of the bob and the tension in the thread from which it is hanging at zero displacement?

	KE	Tension
A	0	Maximum
B	Maximum	Maximum
C	Maximum	Minimum
D	0	Minimum

- 13) Transverse waves can be distinguished from longitudinal waves using

A. Polarization

B. Refraction

C. Reflection

D. Diffraction

- 14) 2.5 kg of water is heated in an open container for 5.00 minutes using a heater of 2.00 KW. Which of the following statements about the temperature of the water is true? (the specific heat capacity of water is $4200 \text{ J kg}^{-1} \text{ K}^{-1}$)

A. The change in temperature of the water is 58.3°C B. The change in temperature of the water is 57.3°C C. The change in temperature of the water is greater than 57.3°C D. If the initial temperature of the water was 23.7°C , then its final temperature would be 810°C

- 15) Which of the following statements about heat transfer is NOT true?

A- Radiation transmits heat through air with the speed of light in air

B- In a fluid, heat is transmitted upwards mainly mass movement of fluid molecules

C- A poor conductor has a low value of thermal conductivity

D- All good thermal conductors are not necessarily good electrical conductors

- 16) When a heating coil is immersed in melting ice, the ice melts at a rate of 10.0 grams per minute. If the current in the coil is doubled while its resistance remains constant, the mass of ice that would melt per minute is

A. 40.0 g

B. 20.0 g

C. 5.0 g

D. 80.0 g

- 17) Which of the following statement is correct? During a change of state:

A. The internal energy of a system increases

B. Latent heat is absorbed

C. Work is done and bonds are broken

D. Work is done and/ or bonds are being broken or constructed

- 18) Figure 2 shows stress/strain curves for different materials taken to "fracture". Which combination of curves labelled P, Q and R best shows the behaviour of a copper wire and a glass fiber respectively?

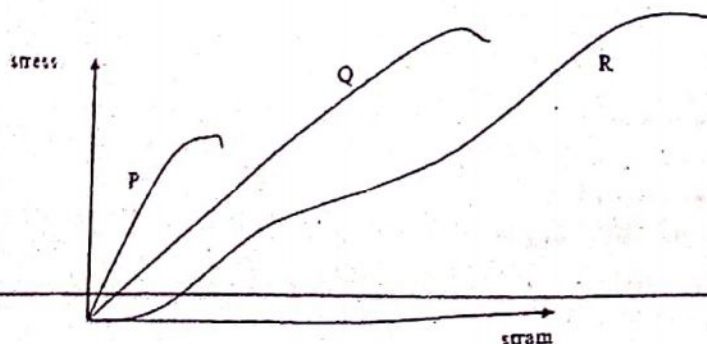


Figure 2

	Copper	Glass fiber
A	P	Q
B	Q	P
C	P	R
D	Q	R

- 18) A graph of intermolecular potential energy against separation can be drawn for a pair of molecules. This is possible for
- A. Solid, liquid, and gas molecules
B. Molecules of solids only
C. Liquid and gas molecules only
D. Liquid and solid molecules only
- 19) The temperature of a given gas of molar mass is 300 K. Its average translational kinetic energy in joules. If Boltzman's constant $= 1.38 \times 10^{-23} \text{ JK}^{-1}$, is
- A. 1.38×10^{-21}
B. 6.21×10^{-21}
C. 6.21×10^{-23}
D. 1.38×10^{-21}
- 20) A wire M of diameter d is joined to another wire N of the same material. The diameter of N is half of that of M but the two wires have the same length. If a steady potential difference is applied across the ends of the composite wire, which of the following statements is correct?
- A. the current in N is half of the current in M
B. The drift velocity of the electrons in N is four times that of the electrons in M
C. The number of charge carries per unit volume in M is twice that in N
D. The drift velocity of electrons in M is twice that of electrons in N
- 21) Which of the following statement about a silicon P-N junction diode is true?
- A. The majority mobile charge carries in the N-type section of the diode are electrons while the minority charge carries in the P-type section of it are holes
B. The net positive charge at the edge of the depletion layer is in the P-type side of the diode
C. The majority mobile electrons in the N-type section of the diode come from donor impurity atoms while the holes that are a majority mobiles charge come from acceptor and are on the silicon atom
D. The holes in the N-type section of the diode are known as free or mobile holes
- 22) Rutherford's alpha particle scattering experiment suggests that an atom
- A. Has an even distribution of Rectifier mass
B. Has a nucleus containing all subatomic particles
C. Has a nucleus of large size and low density
D. Has a nucleus of very small size and very high density
- 23) Which of the following is a major difference between a zener diode and a rectifier diode
- A. Rectifier diode are made from silicon whereas zener diodes are made from germanium
B. Zener diodes operate on reverse bias voltages while rectifier diodes operate on forward bias voltages
C. Rectifier diode are used in power supply circuits while Zener diodes are not
D. Rectifier diodes can replace zener diodes in circuits whereas zener diodes cannot replace rectifier diodes in no circuits
- 24) In a radioactive decay, a radioisotope emits an alpha particle, quickly following by a beta particle. The resulting daughter nuclide:
- A. Gains a unit positive charge
B. Has an atomic number reduced by 2
C. Has a neutron number reduced by 4
D. Has a nucleon number reduced by 4
- 25) A body moves from a point P_1 to another point P_2 in a gravitational field. Which of the following statements about gravitational potential energy is correct?
- A. The change in gravitational potential energy depends on the path between P_1 and P_2
B. The change in gravitational potential energy is dependent of the mass of the body
C. The change in gravitational potential energy is equal to the difference between the kinetic energy at P_1 and the kinetic energy at P_2

D. The change in gravitational potential energy depends on the relative coordinates of P_1 and P_2 not the path taken between them

- 26) A point charge of magnitude Q is moved from one point M to another point N . if its journey between these two point last for an interval of time t and the potential difference between these two points is V , then the work done in moving the point charge is equal to
 A. $I.V$ if the current flowing is I B. $V.Q$ C. $V.Q.t$ D. $(V.Q)/t$
- 27) Two parallel metal plates carrying equal but opposite charge are positioned so that at a point S midway between them, the resultant electric field strength is E . if the distance from each plate to S is doubled, the strength of the electric field at S would be?
 A. E B. $E/8$ C. $E/4$ D. $E/2$
- 28) A particle of mass m and charge Q describes a circular path in a magnetic field is of flux density B . if the magnetic field is uniform, its speed u is constant and radius of its orbit is r , then the frequency of its circular motion in the field is equal to
 A. $\frac{BQ}{2\pi m}$ B. $(BQ)/m$ C. $(BQ)/\pi m$ D. $(2\pi BQ)/m$
- 29) Which of the following quantities that are associated with Kirchhoff's first and second law respectively obey the principles of conservation
 A. Energy and charge B. Energy and momentum C. Charge and energy D. Voltage and charge.
- 30) In the circuit in figure 3, the ammeter and voltmeters readings are I and V respectively. R_1 and R_2 are identical resistors. Which of the combination A to D best describes what happens when the switch S is closed:

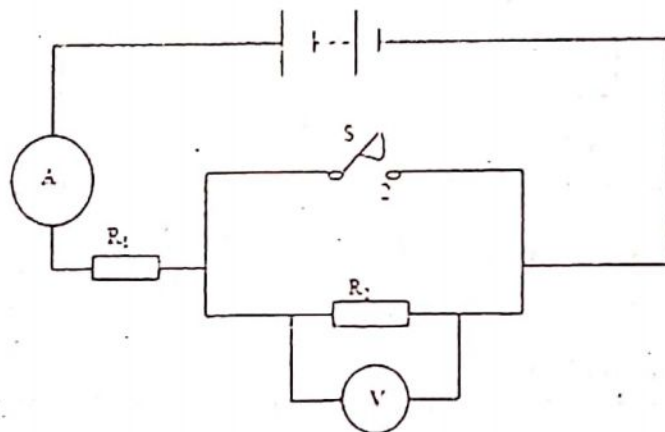


Figure 3

	I	V
A	Decreases	Decreases to zero
B	Increases	Decreases to zero
C	Increases	Remains unchanged
D	Remains unchanged	increases

- 31) Figure 4 shows how three capacitors of capacitances C_1 , C_2 and C_3 are connected to a 9V power supply.

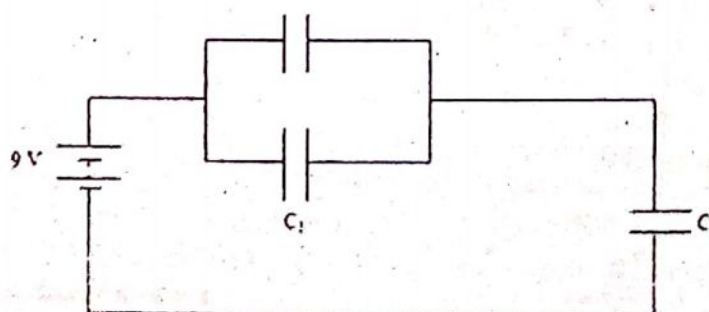


Figure 4

Which of the following statements about the circuit is NOT correct?

A	The total capacitance is $\frac{(C_2 + C_3)C_1}{(C_1 + C_2 + C_3)}$
B	The total charge stored by C_2 and C_3 is equal to the charge stored by C_1
C	The quantities of charge stored by C_2 and C_3 respectively, are the same
D	The total charge stored by the three capacitors is constant.

32)

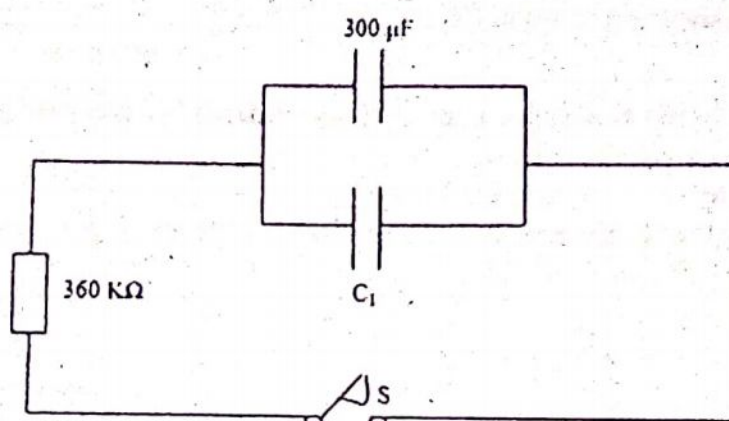


Figure 5

When the switch S of the circuit in figure 5 is closed, the time constant of the circuit is found to be 180 s as the charge capacitors discharge through the $360\text{ k}\Omega$ resistor. The value of the capacitance of C_1 of this to be the case is,

- A. $200\text{ }\mu\text{F}$ B. $150\text{ }\mu\text{F}$ C. $300\text{ }\mu\text{F}$ D. $15\text{ }\mu\text{F}$

33) In the formation of a nucleus, the actual mass of the nucleus formed is less than the sum of the masses of the individual protons and neutrons. The energy equivalence of the mass difference is referred to as

- A. Binding energy B. Work function C. Mass defect D. Lost energy

34) Using a steady force of 150 N , a farmer succeeds in pulling horizontally a 20 kg bag of potatoes through 20 m along a flat horizontal pavement. As she does so, she overcomes frictional force of 50 N . How much work is done on the bag?

- A. 1000 J B. 2000 J C. 3000 J D. 4000 J

35) In Figure 6 shown below, which of the following statements is true about the circuit?

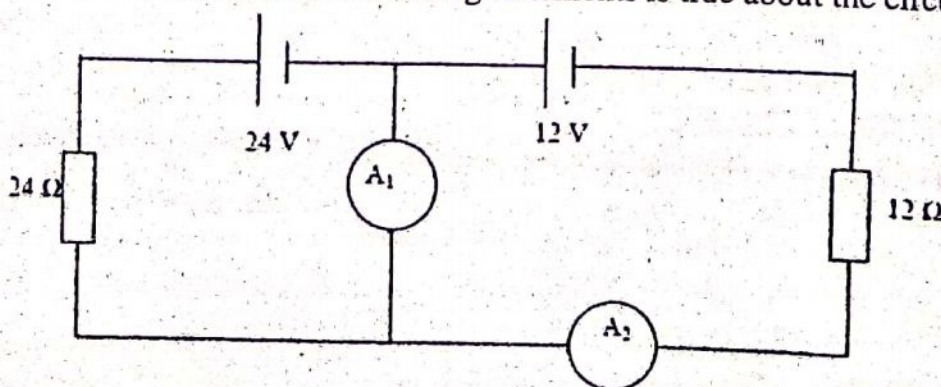


Figure 6

- A. A_1 reads 1 A and A_2 reads zero
 B. A_1 reads 2 A and A_2 reads 1 A
 C. A_1 reads 1 A and A_2 reads 2 A
 D. A_1 reads zero and A_2 reads 1 A

SECTION II (Ten questions)
Multiple Selection

Questions 36-45

Directions: For each group of questions below ONE or TWO of the responses given is/are correct.

Choose;

A- If 1 and 2 are correct

B- If 2 and 3 are correct

C- If 1 only is correct

D- If 3 only is correct

Directions Summarized			
A	B	C	D
1,2 only	2,3 only	1 only	3 only

36) A spherical object is dropped from a certain height above the ground in air such that it falls freely.

1- Its velocity, mass and upthrust are all constant.

2- Its velocity, acceleration and upthrust change continuously.

3- Its velocity and drag force change for some time and stays constant while the upthrust stays constant throughout.

37) Which of the following is a statement of Kepler's second law?

1- the planet describe ellipses about the sun as a focus

2- Planets move faster when they are closer to the sun than when they are very far from it.

3- The line that joins the planet to the sun sweeps out equal areas in equal times.

38) Which of the following statement(s) about capacitors connected in series in a circuit in the process of charging is correct

1- The charge on each capacitor is the same.

2- The effective capacitance of all the capacitors is less than the individual capacitances.

3- The voltage across each capacitor is the same.

39) An ideal gas absorbs 1000 J of heat energy and expands from a volume of 0.025 m^3 to a volume of 0.050 m^3 at a constant pressure of $20 \times 10^3 \text{ Pa}$. Which of the following statement is /are correct?

1- The work done by the gas is 100J.

2- The work done by the gas is 500J

3- The internal energy of the gas changes by 500J

40) The first law of thermodynamics implies that?

1- The amount of energy received by a system is always greater than the work done by the system

2- The efficiency of an engine can be greater than one if and only if there is no energy lost.

3- The internal energy change in a system must be equal to the energy absorbed by the system.

41) The second law of thermodynamics helps one to understand that.

1- Net heat flows only in a particular direction in the universe.

2- The entropy of the universe changes with times.

3- Heat does not flow from a cold to hot object.

42) A pipe of length L is opened at both ends. It is made to resonate such that its second harmonic is at a frequency f . Given that the velocity of sound in air is $V \text{ ms}^{-1}$, it is observed?

1- The fundamental frequency f_0 is larger than f_2 .

2- The fundamental frequency f_0 is the same as f_2 .

3- The fundamental frequency f_0 is half f_2 .

43) Which of the following statement about the mass spectrometer is/are correct?

1- The electric and magnetic fields are arranged perpendicularly to each other

2- The mass/charge, $\frac{m}{q}$, ratio is inversely proportional to the radius r of the circular path of the charge

3- The velocity V in the circular path is independent of the magnetic field B .

44)

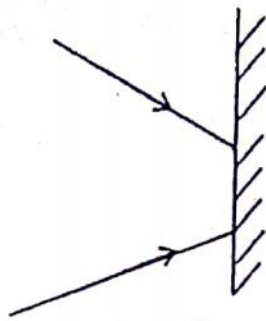


Figure 7

Study the diagram in figure 7 carefully and select the appropriate responses.

- 1- The object in figure 7 is virtual
- 2- The image formed by the plane mirror is real
- 3- The image and object are of different distances from the mirror MN.

45) In an RCL circuit, the current in the circuit

$$I = \frac{V}{\sqrt{(X_L - X_C)^2 + R^2}}$$

- 1- The quantity $\sqrt{(X_L - X_C)^2 + R^2}$ is called the impedance of the system and has the units of ohm.
- 2- A maximum current will flow in the circuit if $X_L = X_C$.
- 3- The resistance R at the resonance point is always zero.

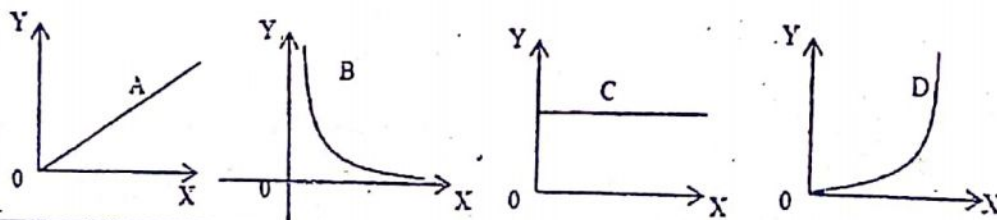
SECTION III (five questions)

Questions 46 – 50

Direction: Each of the questions (46 – 50) has four sets of graphs A – D. Which of the graphs in each questions best fits the relationship between x and y?

46.

Y	x
Kinetic energy of an electron when is accelerated through a potential difference.	Momentum of the electron within the electric field.



47.

Y	x
Stopping potential for photoelectrons	Frequency of incident rays.

