

UME 2001 – Type X

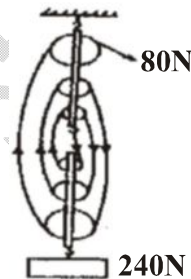
Questions

1. I. The earth is not spherical but elliptical in shape.
 II. Variation in latitude and longitude.
 III. Rotation of the earth on its axis.
 IV. Variation in the density of the earth.

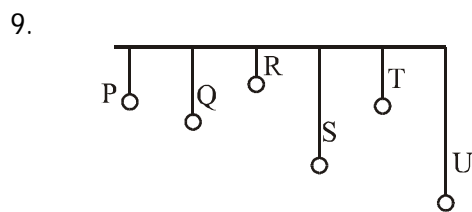
On which combination of the above does the weight of an object vary on the earth's surface?

- A. I, II and III only.
 - B. I, II, III and IV.
 - C. I and II only.
 - D. II, III and IV only.
2. If a spherical metal bob of radius 3cm is fully immersed in a cylinder containing water and the water level rises by 1cm, what is the radius of the cylinder?
 A. 6cm B. 12cm
 C. 1cm D. 3cm.
 3. The efficiency of a machine is always less than 100% because the
 A. velocity ratio is always greater than the mechanical advantage.
 B. work output is always greater than the work input.
 C. effort applied is always greater than the load lifted.
 D. load lifted is always greater than the effort applied.
 4. The height at which the atmosphere ceases to exist is about 80km. If the atmospheric pressure on the ground level is 760mmHg, the pressure at a height of 20km above the ground level is
 A. 380 mmHg B. 190 mmHg
 C. 570 mmHg D. 480 mmHg

5. Which of the following consists entirely vector quantities?
 A. Work, pressure and moment
 B. Velocity, magnetic flux and reaction.
 C. Displacement, impulse and power.
 D. Tension, magnetic flux and mass.
6. The diagram below is a block-and-tackle pulley system in which an effort of 80N is used to lift a load of 240N. The efficiency of the machine is
 A. 40% B. 33%
 C. 60% D. 50%.



7. A stone of mass 1kg is dropped from a height of 10m above the ground and falls freely under gravity. Its kinetic energy 5m above the ground is then equal to
 A. its kinetic energy on the ground.
 B. half its initial potential
 C. its initial potential energy.
 D. twice its initial potential energy.
8. The resultant of two forces acting on an object is maximum if the angle between them is
 A. 45° B. 180° C. 0° D. 90°



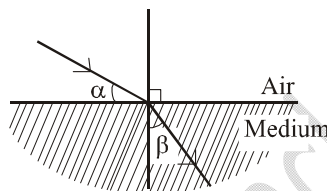
In the diagram above, which of the simple pendula will resonate with P when set into oscillation?

- A. R and T B. Q and R
C. U D. T.

10. The terrestrial telescope has one extra lens more than the astronomical telescope. The extra lens is for
A. erection of the image.
B. improving the sharpness.
C. crating an inverted image.
D. magnification of the image.
11. A plane sound wave of frequency 85.5Hz and velocity 342ms^{-1} is reflected from a vertical wall. At what distance from the wall does the wave have an antinode?
A. 1m B. 1m C. 2m D. 3m
12. A string is fastened tightly between two walls 24cm apart. The wavelength of the second overtone is
12cm B. 24cm C. 8cm D. 16cm
13. A ray of light strikes a plane mirror at an angle of incidence of 35° . If the mirror is rotated through 10° , through what angle is the reflected ray rotated?
A. 45° B. 20° C. 70° D. 25°
14. A gas with initial volume $2 \times 10^{-6}\text{m}^3$ is allowed to expand to six times its initial volume at constant pressure of $2 \times 10^5\text{Nm}^{-2}$. The work done is
A. 4.0J B. 12.0J C. 2.0J D. 1.2J
15. the driving mirror of a car has a radius of curvature of 1m. A vehicle behind the car is 4m from the mirror. Find the image distance behind the mirror.
A. $\frac{8}{7}$ B. $\frac{4}{7}$ C. $\frac{4}{9}$ D. $\frac{9}{2}$
16. The thermometric substance of an absolute thermometer is

- A. helium B. alcohol
C. platinum D. mercury.

17.



If a ray traveling in air is incident on a transparent medium as shown in the diagram, the refractive index of the medium is given as

- A. $\frac{\cos \beta}{\sin \alpha}$ B. $\frac{\cos \alpha}{\sin \beta}$
C. $\frac{\sin \alpha}{\sin \beta}$ D. $\frac{\sin \beta}{\sin \alpha}$

18. Find the frequencies of the first three harmonics of a piano string of length 1.5m, if the velocity of the waves on the string is 120ms^{-1} .
A. 180Hz, 360Hz, 540Hz.
B. 360Hz, 180Hz, 90Hz.
C. 40Hz, 80Hz, 120Hz.
D. 80Hz, 160Hz, 240Hz.
19. The pressure of a given mass of a gas changes from 300Nm^{-2} to 120Nm^{-2} while the temperature drops from 127°C to -73°C . The ratio of the final volume to the initial volume is
A. 2 : 5 B. 4 : 5
C. 5 : 2 D. 5 : 4
20. Ice cubes are added to a glass of warm water. The glass and water are cooled by
A. convection and radiation.
B. conduction only.
C. convection only.
D. conduction and convection.

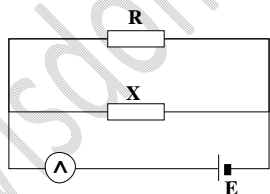
21. A working electric motor takes a current of 1.5A when the p.d. across it is 250V. If its efficiency is 80%, the power output is
- A. 469.0W B. 300.0W
C. 4.8W D. 133.0W.

22. In a Daniel Cell, the depolarizer, positive and negative electrodes are respectively
- A. sulphuric acid, lead oxide and lead.
B. copper sulphate, copper and zinc.
C. potassium hydroxide, nickel and iron.
D. manganese dioxide, carbon and zinc.

23. The cost of running five 6W lamps and four 100W lamps for 20 hours if electrical energy costs N10.00 per KWh is
- A. N280.00 B. N160.00
C. N140.00 D. N120.00

24. A bread toaster uses a current of 4A when plugged in a 240 volts line. It takes one minute to toast slices of bread. What is the energy consumed by the toaster?
- A. $3.60 \times 10^3 \text{J}$ B. $5.76 \times 10^4 \text{J}$
C. $1.60 \times 10^2 \text{J}$ D. $1.60 \times 10^4 \text{J}$

25.



In the circuit diagram above, the ammeter reads a current of 3A when R is 5Ω and 6A when R is 2Ω . Determine the value of x.

- A. 10Ω B. 8Ω C. 4Ω D. 2Ω

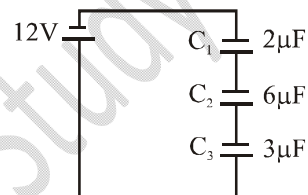
26. What is the angle of dip at the magnetic equator?

A. 0° B. 45° C. 90° D. 180°

27. When a piece of rectangular glass block is inserted between two parallel plate capacitors, at constant plate area and distance of separation, the capacitance of the capacitor will

A. remain constant
B. decrease, then, increase
C. decrease D. increase.

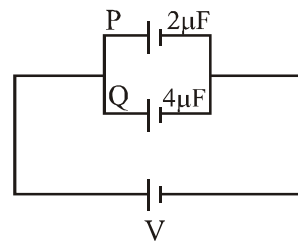
28.



The diagram shows three capacitors C_1 , C_2 and C_3 of capacitances $2\mu\text{F}$, $6\mu\text{F}$ and $3\mu\text{F}$ respectively. The potential differences across C_1 , C_2 and C_3 respectively are

A. 6V, 2V and 4V.
B. 6V, 4V and 2V.
C. 2V, 6V and 4V.
D. 4V, 6V and 2V.

29.



The diagram above shows two capacitors P and Q and capacitances $2\mu\text{F}$ and $4\mu\text{F}$ respectively connected to a d.c. source. The ratio of energy stored in P to Q is

A. 1 : 2 B. 2 : 1 C. 4 : 1 D. 1 : 4

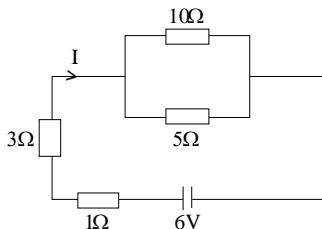
30. The ratio of electrostatic force F_E to gravitational force F_G between two protons each of charge e and mass m , at a distance d is

A. $\frac{e}{4\pi\epsilon_0 Gm}$ B. $\frac{e^2}{4\pi\epsilon_0 Gm^2}$
 C. $\frac{e^2}{Gm^2}$ D. $\frac{Gm^2}{4\pi\epsilon_0 e^2}$

31. A cell can supply currents of 0.4A and 0.2A through a 4.0Ω and 10.0Ω resistors respectively. The internal resistance of the cell is

A. 1.5Ω B. 1.0Ω C. 2.5Ω D. 2.0Ω

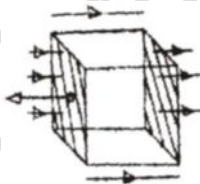
32.



In the diagram above, the current I is

A. $\frac{9}{11}A$ B. $\frac{3}{8}A$
 C. $\frac{8}{3}A$ D. $\frac{11}{9}A$

33.



The diagram above shows a closed square box of side $0.5m$ in a uniform electric field E in the direction shown by the arrows. What is the flux ϕ for the box?

A. $0.5E$ B. $2.0E$ C. $0.0E$ D. $0.2E$

34. A cell of internal resistance r supplies current to a 6.0Ω resistor and its efficiency 75%, find the value of r .

A. 2.0Ω B. 1.0Ω C. 4.5Ω D. 8.0Ω

35. A resistance R is connected across the terminal of an electric cell of internal resistance 2Ω and the voltage was

reduced to $\frac{3}{5}$ of its nominal value. The value of R is

A. 1Ω B. 2Ω C. 3Ω D. 6Ω

36. A student is at a height $4m$ above the ground during a thunderstorm. Given that the potential difference between the thunderstorm and the ground is 10^7V , the electric field created by the storm is

A. $2.0 \times 10^6 NC^{-1}$.
 B. $4.0 \times 10^7 NC^{-1}$.
 C. $1.0 \times 10^7 NC^{-1}$.
 D. $2.5 \times 10^6 NC^{-1}$.

37. At resonance, the phase angle in an a.c. circuit is

A. 0° B. 60° C. 90° D. 180°

38. The process of energy production in the sun is

A. radioactive decay
 B. electron collision.
 C. Nuclear fission.
 D. Nuclear fusion.

39. I. Low pressure.
 II. High pressure.
 III. High p.d.
 IV. Low p.d.

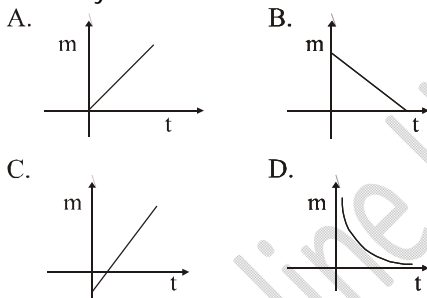
Which combination of the above is true of the conduction of electricity through gases?

A. II and III only.
 B. II and IV only.
 C. I and III only.

- D. I and IV only.
40. A capacitor of $20 \times 10^{-12}\text{F}$ and an inductor are joined in series. The value of the inductance that will give the circuit a resonant frequency of 200 KHz is

A. $\frac{1}{64}$ B. $\frac{1}{32}$ C. $\frac{1}{16}$ D. $\frac{1}{8}$

41. A transistor functions mainly as a
- A. rectifier and an amplifier.
 B. charge storer and an amplifier.
 C. charge storer and a switch.
 D. Switch and an amplifier.
42. Which of the following graphs correctly represents the variation of mass of a given material deposited with time for constant current in Faraday's Law of Electrolysis?

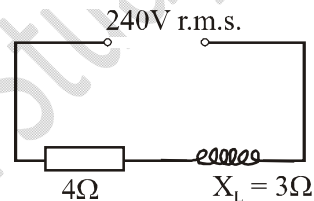


43. Which of the following metals will provide the greatest shield against ionizing radiation?
- A. Lead B. Manganese
 C. Aluminium D. Iron.
44. Energy losses through eddy currents are reduced by using
- A. low resistance wires.
 B. high resistance wires.
 C. few turns of wire.
 D. insulated soft iron wires.
45. The particle emitted when ${}_{19}^{39}\text{K}$ decays to ${}_{19}^{39}\text{K}$ is

A. electron B. beta
 C. alpha D. gamma.

46. The magnetic force on a charged particle moving with velocity v is
- A. independent of the magnitude of the charge.
 B. proportional to both the magnitude of the charge and the velocity v .
 C. proportional to the velocity v only.
 D. proportional to the magnitude of the charge only.

47.



In the diagram above, determine the r.m.s. current.

- A. 60A B. 80A C. 31A D. 48A
48. The force on a current carrying conductor in a magnetic field is greatest when the
- A. conductor is at right angles with the field.
 B. force is independent of the angle between the field and the conductor.
 C. conductor is parallel with the field.
 D. conductor makes an angle of 60° with the field.
49. The current through a resistor in an a.c. circuit is given as $2 \sin \omega t$. Determine the d.c. equivalent of the current.
- A. $\frac{1}{\sqrt{2}}\text{A}$ B. $\sqrt{2}\text{A}$
 C. 2A D. $2\sqrt{2}\text{A}$

50. The primary coil of a transformer has N turns and is connected to a 120V a.c. power line. If the secondary coil has 1000 turns and a terminal voltage of 1200 volts, what is the value of N ?
A. 1000 B. 120 C. 100 D. 1200

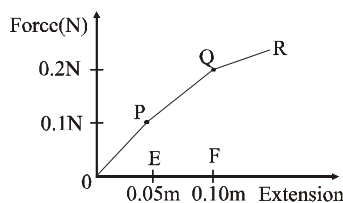
2001 Solutions

1. Option B.
2. Option A.
3. Option A.
4. Option C.
5. Option B.
6. Option D.
7. Option B.
8. Option C.
9. Option D.
10. Option A.
11. Option B.
12. Option D.
13. Option B.
14. Option C.
15. Option C.
16. Option B.
17. Option B.
18. Option C.
19. Option D.
20. Option D.
21. Option B.
22. Option B.
23. Option C.
24. Option B.
25. Option A.
26. Option A.
27. Option D.
28. Option A.
29. Option A.
30. Option B.
31. Option D.
32. Option A.

33. Option C.
34. Option A.
35. Option C.
36. Option D.
37. Option A.
38. Option D.
39. Option C.
40. Option B.
41. Option D.
42. Option A.
43. Option A.
44. Option D.
45. Option D.
46. Option B.
47. Option D.
48. Option A.
49. Option B.
50. Option C.

UME 2002 Type 4 Questions

1.



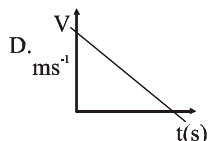
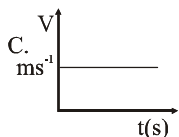
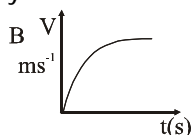
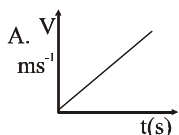
The diagram above shows the force-extension curve of a piece of wire. The energy stored when the wire is stretched from E to F is

- A. $7.5 \times 10^{-3} \text{J}$ B. $2.5 \times 10^{-3} \text{J}$
C. $1.5 \times 10^{-2} \text{J}$ D. $7.5 \times 10^{-1} \text{J}$
2. A copper cube weights 0.25 N in air, 0.17N when completely immersed in paraffin oil and 0.15N when completely immersed in water. The ratio of upthrust in oil to upthrust in water is
A. 3 : 5 B. 4 : 5 C. 7 : 10 D. 13 : 10

3. A wheel and axle is used to raise a load of 500 N by the application of an effort of 250N. If the radii of the wheel and the axle are 0.4cm and 0.1cm respectively, the efficiency of the machine is

A. 20% B. 40% C. 50% D. 60%

4. Which of the following is the correct shape of the velocity-time graph of a spherical steel ball dropped into a viscous fluid in a tall cylinder?



5. The hydrostatic blood pressure difference between the head and feet of a boy standing straight is $1.65 \times 10^4 \text{ Nm}^{-2}$. Find the height of the boy.

A. 0.5m B. 0.6m C. 1.5m D. 2.0m
[Density of blood = $1.1 \times 10^3 \text{ kgm}^{-3}$, $g = 10 \text{ m}^{-2}$]

6. A body weighing 80N stands in an elevator that is about to move. The force exerted by the floor on the body as the elevator moves upward with an acceleration of 5 ms^{-2}

A. 40 N B. 80 N C. 120N D. 160N

7. If the distance between two suspended masses 10kg each is tripled, the gravitational force of attraction between them is reduced by

A. one half B. one third
C. one quarter D. one ninth

8. If the total force acting on a particle is zero, the linear momentum will

A. increase
B. decrease
C. be constant
D. increase then decrease

9. Two force each of 10N act on a body, one towards the north and the other towards the east. The magnitude and the direction of the resultant force are

A. 20N, 45°E B. 20N, 45°W
C. $10\sqrt{2}$ N, 45°W D. $10\sqrt{2}$ N, 45°E

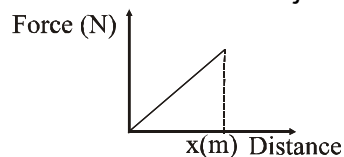
10. A particle in circular motion performs 30 oscillations in 6 seconds. Its angular velocity is

A. 5 rad s^{-1} B. 6 rad s^{-1}
C. $5\pi \text{ rad s}^{-1}$ D. $10\pi \text{ rad s}^{-1}$

11. the effect of a particle in a fluid attaining its terminal velocity is that the

A. acceleration is maximum
B. weight is equal to the retarding force
C. buoyancy force is equal to the viscous retarding force
D. buoyancy force is more than the weight of the fluid displaced

12. The diagram above shows the force (F) acting on an object through a distance (x). The work done on this object is



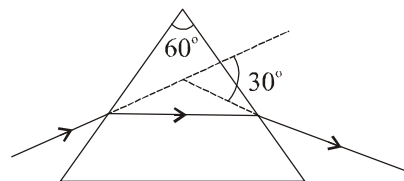
A. $F \times J$ B. $\frac{F}{2} \times J$

C. $Fx^2 J$ D. $\frac{F}{x} J$

13. A coin placed below a rectangular glass block of thickness 9cm and refractive index 1.5 is viewed vertically above the

- block. The apparent displacement of the coin is
A. 3cm B. 5cm C. 6cm D. 8cm
14. The radiator of a motor car is cooled by
A. radiation
B. conduction
C. convection
D. radiation and conduction
15. I. Temperature.
II. Density of air molecules.
III. Pressure.
IV. Pitch.
Which of the above will affect the velocity of sound in air?
A. I and II only.
B. II and IV only.
C. I, II and IV only.
D. I, II, III and IV.
16. Which of the following is a characteristic of stationary wave?
A. They are formed by two identical waves traveling in opposite directions.
B. They can be transverse or longitudinal.
C. The distance between two successive nodes is one wavelength.
D. The antinode is a point of minimum displacement.
17. To produce an enlarged and erect image with a concave mirror, the object must be positioned
A. at the principal focus.
B. beyond the centre of curvature.
C. between the principal focus and the centre of curvature.
D. between the principal focus and the pole.
18. The property that is propagated in a traveling wave is
A. frequency B. amplitude.
C. energy D. wavelength
19. Which of the following eye defects can be corrected using a cylindrical lens?
A. Myopia B. Astigmatism
C. Presbyopia
D. Chromatic aberration
20. The time rate of loss of heat by a body is proportional to the
A. difference in temperature between the body and its surroundings
B. temperature of its surroundings
C. ratio of the temperature of the body to that of its surroundings
D. temperature of the body.
21. If tension is maintained on a stretched string of length 0.6m such that its fundamental frequency of 220Hz is excited, determine the velocity of the transverse wave in the string.
A. 528ms^{-1} B. 264ms^{-1}
C. 132ms^{-1} D. 66ms^{-1}
22. A concave mirror of radius of curvature 40cm forms a real image twice as large as the object. The object distance is
A. 10cm B. 30cm
C. 40cm D. 60cm.
23. Water is a poor thermometric liquid because it
A. is opaque
B. is a poor conductor.
C. wets glass.
D. has low vapour pressure.
24. A ray of light which strikes a glass slab from air at normal incidence passes through the slab

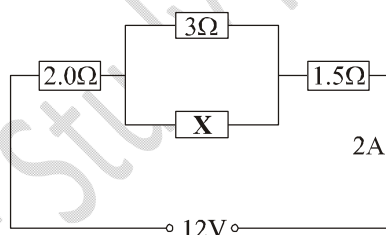
- A. undeviated and undisplaced at a lower speed.
 B. deviated and undisplaced at a lower speed.
 C. deviated and displaced at a lower speed.
 D. undeviated and displaced at a faster speed.
25. Blowing air over a liquid aids evaporation by
 A. increasing its surface area.
 B. decreasing its vapour pressure.
 C. increasing temperature.
 D. decreasing its density.
26. The phenomenon that makes sound persist when its source has been removed is known as
 A. acoustic vibration
 B. rarefaction C. echo
 D. reverberation.
27. The pressure of 3 moles of an ideal gas at a temperature of 27°C having a volume of 10^{-3}m^3 is
 A. $2.49 \times 10^5 \text{Nm}^{-2}$
 B. $7.47 \times 10^5 \text{Nm}^{-2}$
 C. $2.49 \times 10^6 \text{Nm}^{-2}$
 D. $7.47 \times 10^6 \text{Nm}^{-2}$
 [R = $8.3\text{J mol}^{-1}\text{K}^{-1}$]
28. Vibration in a stretched spring cannot be polarized because they are
 A. stationary waves.
 B. transverse waves.
 C. longitudinal waves.
 D. mechanical waves.
29. The colours seen in soap bubbles are due to
 A. diffraction B. refraction
 C. dispersion D. interference.
- 30.



Calculate the refractive index of the material for the glass prism in the diagram above.

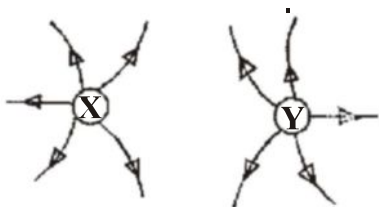
- A. $\frac{\sqrt{2}}{2}$ B. $\frac{4}{3}$ C. $\sqrt{2}$ D. $\frac{3}{2}$

31.



From the diagram above, determine the value of the resistance X.

- A. 6Ω B. 9Ω C. 12Ω D. 15Ω
32. The energy stored in a capacitor of capacitance $10\mu\text{F}$ carrying a charge of $100\mu\text{C}$ is
 A. $5 \times 10^4 \text{J}$ B. $4 \times 10^2 \text{J}$
 C. $4 \times 10^{-3} \text{J}$ D. $5 \times 10^{-4} \text{J}$
33. When connected to a mains of 250V , the fuse rating in the plug of an electric device of 1kW is
 A. 2A B. 3A C. 4A D. 5A .
34. The eye controls the amount of light reaching the retina by adjusting the
 A. cornea B. iris
 C. retina D. optic nerve.
35. An electric iron is rated 1000W , 230V . What is the resistance of its element?
 A. 51.9 B. 52.9 C. 55.9 D. 57.6
- 36.

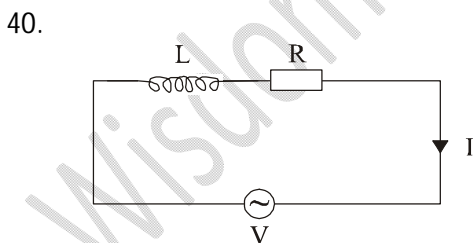


The electric field between two-point charges is shown in the diagram above. What types of charges are at X and Y?

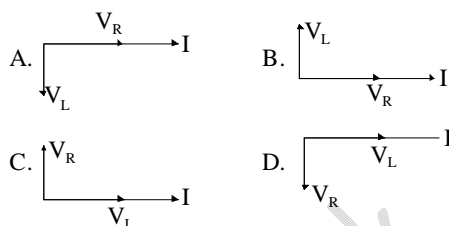
- A. Both X and Y are negative.
- B. Both X and Y are positive.
- C. X is positive and Y is negative.
- D. X is negative and Y is positive.

37. The electromagnetic wave that can produce a heating effect on the environment is
- A. X-rays
 - B. ultraviolet rays
 - C. infra-red rays
 - D. gamma rays
38. An electric cell with nominal voltage E has a resistance of 3Ω connected across it. If the voltage falls to $0.6E$, the internal resistance of the cell is
- A. 1Ω
 - B. 2Ω
 - C. 3Ω
 - D. 4Ω

39. ${}^{23}_{11}\text{Na} + X \rightarrow {}^{20}_9\text{F} + {}^4_2\text{He}$.
What particle is X in the reaction above?
- A. Alpha
 - B. Beta
 - C. Neutron
 - D. Gamma.



Which of the following graphs shows the correct vector diagram for the circuit above?



41. Pure silicon can be converted to a p-type material by adding a controlled amount of
- A. trivalent atoms
 - B. tetravalent atoms
 - C. pentavalent
 - D. hexavalent atoms
42. The energy associated with the photon of a radio transmission at $3 \times 10^5 \text{Hz}$ is
- A. $2.00 \times 10^{-28} \text{J}$
 - B. $1.30 \times 10^{-28} \text{J}$
 - C. $2.00 \times 10^{-29} \text{J}$
 - D. $1.30 \times 10^{-29} \text{J}$
- [$h = 6.63 \times 10^{-34} \text{Js}$]
43. The percentage of the original nuclei of a sample of a radioactive substance left after 5 half-lives is
- A. 8%
 - B. 5%
 - C. 3%
 - D. 1%
44. From the generating station to each substation, power is transmitted at a very high voltage so as to reduce
- A. hysteresis loss
 - B. eddy current loss
 - C. magnetic flux leakage
 - D. heating in the coils.
45. The particle that is responsible for nuclear fission in a nuclear reactor is
- A. neutron
 - B. proton
 - C. electron
 - D. photon.
46. A transistor is used in the amplification of signals because it
- A. controls the flow of current.
 - B. consumes a lot of power.
 - C. allows doping.
 - D. contains electron and hole carriers.

-
47. The carbon-granule microphone works on the principle of change in
 A. inductance B. resistance
 C. capacitance D. voltage.
48. At what frequency would a capacitor of $2.5\mu\text{F}$ used in a radio circuit have a reactance of 250Ω ?
 A. $\frac{\pi}{800}\text{Hz}$ B. $\frac{800}{\pi}\text{Hz}$
 C. $200\pi\text{Hz}$ D. $2000\pi\text{Hz}$
49. A current of 0.5A flowing for 3 hours deposits 2g of a metal during electrolysis. The quantity of the same metal that would be deposited by a current of 1.5A flowing in 1 hour is
 A. 2g B. 6g C. 10g D. 18g
50. Which of the following statements is true of the properties of a moving coil galvanometer?
 A. The coil has a small area.
 B. There are strong hair springs to give a large control couple.
 C. There is a strong permanent magnet to give high magnetic flux.
 D. It has a small number of turns of coil.
13. Option A.
 14. Option C.
 15. Option A.
 16. Option A.
 17. Option D.
 18. Option C.
 19. Option B.
 20. Option A.
 21. Option B.
 22. Option B.
 23. Option C.
 24. Option A.
 25. Option B.
 26. Option D.
 27. Option D.
 28. Option C.
 29. Option C.
 30. Option C.
 31. Option D.
 32. Option D.
 33. Option C.
 34. Option B.
 35. Option B.
 36. Option B.
 37. Option C.
 38. Option B.
 39. Option C.
 40. Option B.
 41. Option A.
 42. Option A.
 43. Option C.
 44. Option D.
 45. Option A.
 46. Option A.
 47. Option B.
 48. Option B.
 49. Option A.
 50. Option C.

2002 Solutions

1. Option A.
 2. Option B.
 3. Option C.
 4. Option B.
 5. Option C.
 6. Option C.
 7. Option D.
 8. Option C.
 9. Option D.
 10. Option D.
 11. Option B.
 12. Option B.

UME 2003 Type 9

Questions

1. A bead traveling on a straight wire is brought to rest at 0.2m by friction. If the mass of the bead is 0.01kg and the coefficient of friction between the bead and the wire is 0.1, determine the workdone by the friction.
 A. 2×10^{-4} J B. 2×10^{-3} J
 C. 2×10^1 J D. 2×10^2 J

[$g = 10 \text{ ms}^{-1}$.]

2. On top of a spiral spring of force constant 500Nm^{-1} is placed a mass of 5×10^{-3} kg. If the spring is compressed downwards by a length of 0.02m and then released, calculate the height to which the mass is projected.
 A. 8m B. 4m C. 2m D. 1m
3. A test tube of radius 1.0cm is loaded to 8.8g. If it is placed upright in water, find the depth to which it would sink.
 A. 2.8cm B. 5.2cm
 C. 25.5cm D. 28.0cm
 [$g = 10\text{ms}^{-2}$; density of water = 1000kgm^{-3}]

4.



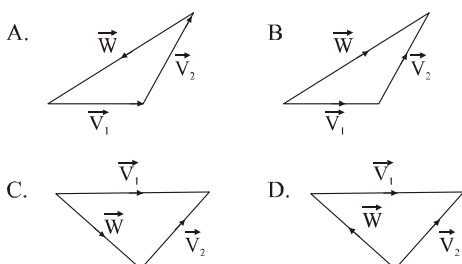
The length of a piece of glass block was measured by means of a vernier caliper as shown above. The length of the glass block is

- A. 1.63cm B. 1.64cm
 C. 1.65cm D. 1.66cm
5. A hose of cross-sectional area 0.5m^2 is used to discharge water from a water tanker at a velocity of 60ms^{-1} in 20s into a container. If the container is filled completely, the volume of the container is
 A. 240m^3 B. 600m^3

- C. 2400m^3 D. 6000m^3
6. If an object just begins to slide on a surface inclined at 30° to the horizontal, the coefficient of friction is
 A. $\sqrt{3}$ B. $\frac{\sqrt{3}}{2}$ C. $\frac{1}{\sqrt{2}}$ D. $\frac{1}{\sqrt{3}}$
7. A force of 100N is used to kick a football of mass 0.8kg. Find the velocity with which the ball moves if it takes 0.8s to be kicked.
 A. 32ms^{-1} B. 50ms^{-1}
 C. 64ms^{-1} D. 100ms^{-1}
8. Water does not drop through an open umbrella of silk material unless the inside of the umbrella is touched. This is due to
 A. capillarity B. osmotic pressure
 C. viscosity D. surface tension.
9. The stylus of a phonograph record exerts a force of $7.7 \times 10^{-2}\text{N}$ on a groove of radius 10^{-5}m . Compute the pressure exerted by the stylus on the groove.
 A. $2.45 \times 10^8\text{Nm}^{-2}$ B. $3.45 \times 10^8\text{Nm}^{-2}$
 C. $4.90 \times 10^8\text{Nm}^{-2}$ D. $2.42 \times 10^9\text{Nm}^{-2}$
10. A piece of stone attached to one end of a string is whirled round in a horizontal circle and the string suddenly cuts. The stone will fly off in a direction
 A. perpendicular to the circular path.
 B. parallel to the circular path.
 C. tangential to the circular path.
 D. towards the centre of the circle.
11. A 90cm uniform lever has a load of 30N suspended at 15cm from one of its ends. If the fulcrum is at the centre of gravity, the force that must be applied at its other end to keep it in horizontal equilibrium is
 A. 15N B. 20N C. 30N D. 60N.
- 12.



The figure above shows two velocities \vec{V}_1 and \vec{V}_2 . Which of the following diagrams correctly represents the vector difference $\vec{W} = \vec{V}_1 - \vec{V}_2$?



13. A satellite is in a parking orbit if its period is
- less than the period of the earth.
 - more than the period of the earth.
 - equal to the period of the earth.
 - the square of the period of the earth.

14.

$T^{\circ}\text{C}$	s.v.p (mm Hg)
0	4.58
5	6.51
10	8.94
15	12.67
20	17.50
40	55.10
60	149.00

The table above shows the saturation vapour pressure against temperature in a certain town. If the vapour pressure in this town at 20°C is 10 mmHg, what is the relative humidity?

- 170.0%
- 57.0%
- 17.5%
- 10.0%

15. A tuning fork of frequency 340 Hz is vibrated just above a cylindrical tube of height 1.2m. If water is slowly poured into the tube, at what maximum height will resonance occur?
- 0.95m
 - 0.60m
 - 0.50m
 - 0.45m

[Speed of sound in air = 340ms^{-1}].

16. By what factor will the size of an object placed 10cm from a convex lens be increased if the image is seen on a screen placed 25cm from the lens?
- 15.0
 - 2.5
 - 1.5
 - 0.4

17. Thermal equilibrium between two objects exists when

- the temperatures of both objects are equal.
- the quantity of heat in both objects is the same.
- the heat capacities of both objects are the same.
- one object loses heat continuously to the other.

18. An open pipe closed at one end produces its first fundamental note. If the velocity of sound in air is v and l the length of the pipe, the frequency of the note is

- $\frac{2v}{l}$
- $\frac{v}{5l}$
- $\frac{v}{4l}$
- $\frac{v}{2l}$

19. Given that Young's modulus for aluminium is $7.0 \times 10^{10} \text{Nm}^{-2}$ and density is $2.7 \times 10^3 \text{kgm}^{-3}$, find the speed of the sound produced if a solid bar is struck at one end with a hammer.

- $5.1 \times 10^3 \text{ms}^{-1}$
- $4.2 \times 10^3 \text{ms}^{-1}$
- $3.6 \times 10^3 \text{ms}^{-1}$
- $2.8 \times 10^3 \text{ms}^{-1}$

20. On a fairly cool rainy day when the temperature is 20°C , the length of a steel railroad track is 20cm. What will

be its length on a hot dry day when the temperature is 40°C ?

- A. 20.013m B. 20.009m
C. 20.004m D. 20.002m

[Coefficient of linear expansion of steel = $11 \times 10^{-6} \text{K}^{-1}$].

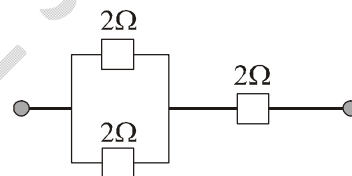
21. If an object is placed between two parallel plane mirrors with their reflecting surfaces facing each other, how many images of the object will be formed?
A. Infinite B. Eight C. Four D. Two.
22. The phenomenon whereby the water droplets in the atmosphere combine with dust particles in the air to reduce visibility is
A. cloud B. mist C. hail D. fog.
23. At what position will an object be placed in front of a concave mirror in order to obtain an image at infinity?
A. At the pole of the mirror.
B. At the principal focus.
C. At the centre of curvature
D. Between the principal focus and the centre of curvature.
24. If the distance from a point source of sound is doubled, by what factor does the intensity decrease?
A. 4.00 B. 2.00 C. 0.50 D. 0.25
25. A 2000W electric heater is used to heat a metal object of mass 5kg initially at 10°C . If a temperature rise of 30°C is obtained after 10 min, the heat capacity of the material is
A. $6.0 \times 10^4 \text{J}^{\circ}\text{C}^{-1}$ B. $4.0 \times 10^4 \text{J}^{\circ}\text{C}^{-1}$
C. $1.2 \times 10^4 \text{J}^{\circ}\text{C}^{-1}$ D. $8.0 \times 10^3 \text{J}^{\circ}\text{C}^{-1}$
26. If $1.2 \times 10^6 \text{J}$ of heat energy is given off in 1 sec from a vessel maintained at a

temperature gradient of 30Km^{-1} , the surface area of the vessel is

- A. $1.0 \times 10^2 \text{m}^2$ B. $9.0 \times 10^2 \text{m}^2$
C. $1.0 \times 10^3 \text{m}^2$ D. $9.0 \times 10^4 \text{m}^2$

27. A positively charged rod X is brought near an uncharged metal sphere Y and is then touched by a finger with X still in place. When the finger is removed, the result is that Y has
A. no charge and a zero potential.
B. a positive charge and a zero potential
C. a negative charge and a positive potential.
D. a negative charge and a negative potential.

28.

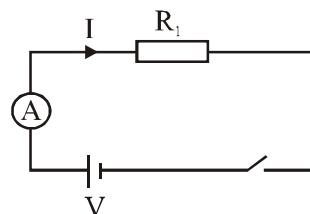


In the diagram above, if each of the resistors can dissipate a maximum of 18W without becoming excessively heated, what is the maximum power the circuit can dissipate?

- A. 27W B. 18W C. 9W D. 5W.

29. The operation of an optical fibre is based on the principle of
A. dispersion of light
B. interference of light
C. refraction of light
D. polarization of light.

30.



- In the diagram above, what would happen to the current, I , if another resistor, R_2 , is connected in parallel to R_1 ?
- A. It will increase because the equivalent resistance will increase.
 B. It will decrease if R_2 is greater than R_1 .
 C. It will increase because the effective resistance will decrease.
 D. It will decrease if R_2 is less than R_1 .
31. A ray of light is incident on an equilateral triangular prism of refractive index $\frac{3}{2}$. Calculate the angle through which the ray is minimally deviated in the prism.
 A. 30.0° B. 37.2° C. 42.0° D. 48.6°
32. A wire of 5Ω resistance is drawn out so that its new length is two times the original length. If the resistivity of the wire remains the same and the cross-sectional area is halved, the new resistance is
 A. 40Ω B. 20Ω C. 10Ω D. 5Ω
33. An electron of charge $1.6 \times 10^{-19}\text{C}$ is accelerated between two metal plates. If the kinetic energy of the electron is $4.8 \times 10^{-17}\text{J}$, the potential difference between the plates is
 A. 30V B. 40V C. 300V D. 400V
34. A magnetic field is said to exist at a point if a force is
 A. exerted on a stationary charge at the point.
 B. exerted on a moving charge at the point.
 C. deflected at the point.
 D. strengthened at the point.
35. I. It retains its magnetism much longer than steel.
 II. It is more easily magnetized than steel.
 III. It is more easily demagnetized than steel.
 IV. It produces a stronger magnet than steel.
 Which combination of the above makes iron preferable to steel in the making of electromagnets?
 A. I and II only B. II and III only
 C. I, III and IV only. D. II, III and IV only.
36. Which of the following pairs of light rays shows the widest separation in the spectrum of white light?
 A. Blue and red. B. Green and yellow
 C. Indigo and violet D. Orange and red.
37. The most suitable cell used for short interval switches in electric bells is a
 A. lead-acid accumulator.
 B. Daniel Cell C. Leclanche Cell
 D. nickel-iron accumulator.
38. A ray incident on a glass prism undergoes minimum deviation when the
 A. incident angle is equal to the angle of refraction.
 B. refraction angle equals 90° .
 C. incident angle equals 90°
 D. incident angle is equal to the angle of emergence.
39. In the calibration of an ammeter using Faraday's law of electrolysis, the ammeter reading is kept constant at 1.20A. If 0.990g of copper is deposited in 40 minutes, the correction to be applied to the ammeter is
 A. 0.30A B. 0.04A C. 0.05A D. 0.06A.
 [e.c.e. of copper = $3.3 \times 10^{-4}\text{gC}^{-1}$]

40. The count rate of a radioactive material is 800 count/min. If the half-life of the material is 4 days, what would be the count rate 16 days later?
A. 200 count/min. B. 100 count/min.
C. 50 count/min. D. 25 count/min.
41. A circuit has an area of 0.4m^2 and consists of 50 loops of wire. If the loops are twisted and allowed to rotate at a constant angular velocity of 10 rad s^{-1} in a uniform magnetic field of 0.4T , the amplitude of the induced voltage is
A. 8V B. 16V C. 20V D. 80V.
42. If the uncertainty in the measurement of the position of a particle is $5 \times 10^{-10}\text{m}$, the uncertainty in the momentum of the particle is
A. $1.32 \times 10^{-44}\text{Ns}$ B. $3.30 \times 10^{-44}\text{Ns}$
C. $1.32 \times 10^{-24}\text{Ns}$ D. $3.30 \times 10^{-24}\text{Ns}$
43. The force on a charge moving with velocity v in a magnetic field B is half of the momentum force when the angle between v and B is
A. 90° B. 45° C. 30° D. 0° .
44. The maximum kinetic energy of the photoelectrons emitted from a metal surface is 0.34eV . If the work function of the metal surface is 1.83eV , find the stopping potential.
A. 2.17V B. 1.49V C. 1.09V D. 0.34V
45. When an alternating current given by $I = 10\sin(120\pi)t$ passes through a 12Ω resistor, the power dissipated in the resistor is
A. 1200W B. 600W C. 120W D. 30W
46. In a fission process, the decrease in mass is 0.01% . How much energy could be obtained from the fission of 1.0g of the material?
A. $9.0 \times 10^9\text{J}$ B. $9.0 \times 10^{10}\text{J}$
C. $6.3 \times 10^{11}\text{J}$ D. $9.0 \times 10^{11}\text{J}$
[$c = 3.0 \times 10^8\text{ms}^{-1}$]
47. In a semi-conductor junction diode, as the depletion or barrier layer is forward-biased, the layer
A. widens
B. narrows
C. remains constant
D. widens then narrows.
48. An electron makes a transition from a certain energy level E_k to the ground state E_0 . If the frequency of emission is $8.0 \times 10^{14}\text{Hz}$, the energy emitted is
A. $8.25 \times 10^{-19}\text{J}$ B. $5.28 \times 10^{-19}\text{J}$
C. $5.28 \times 10^{19}\text{J}$ D. $8.25 \times 10^{19}\text{J}$
[$h = 6.6 \times 10^{-34}\text{Js}$]
49. The major difference between a pure semi-conductor and a pure metal is that
A. metals are harder than semi-conductors.
B. while the resistance of metals decreases with temperature, the reverse is the case for semi-conductors.
C. the resistance of metals increases with temperature while for semi-conductors, it is the reverse.
D. metals have forbidden gaps while semi-conductors have not.
50. When a nucleus is formed by bringing protons and neutrons together, the actual mass of the formed nucleus is less than the sum of the masses of the constituent protons and neutrons. The energy equivalent of this mass difference is the
A. lost energy
B. work function
C. binding energy
D. stability energy.

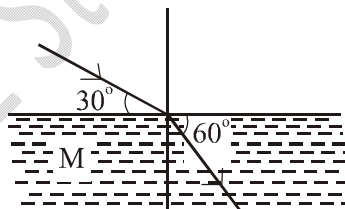
2003 Solutions

1. Option B.
2. Option C.
3. Option A.
4. Option B.
5. Option B.
6. Option D.
7. Option D.
8. Option D.
9. Option A.
10. Option C.
11. Option B.
12. Option C.
13. Option C.
14. Option B.
15. Option A.
16. Option B.
17. Option A.
18. Option C.
19. Option A.
20. Option C.
21. Option A.
22. Option D.
23. Option B.
24. Option D.
25. Option B.
26. Option A.
27. Option D.
28. Option A.
29. Option C.
30. Option C.
31. Option B.
32. Option B.
33. Option C.
34. Option B.
35. Option D.
36. Option A.
37. Option C.
38. Option D.
39. Option C.

40. Option C.
41. Option D.
42. Option C.
43. Option C.
44. Option D.
45. Option B.
46. Option A.
47. Option B.
48. Option B.
49. Option C.
50. Option C.

UME 2004 Type S Questions

1.

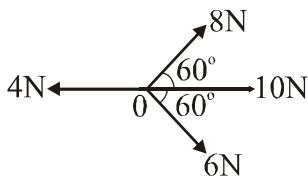


The refractive index of the medium M in the diagram above is

- A. $\frac{2}{\sqrt{3}}$ B. $\frac{1}{\sqrt{3}}$ C. $2\sqrt{3}$ D. $\sqrt{3}$

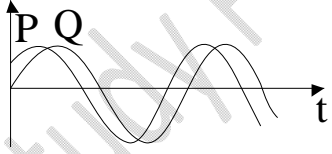
2. Which types of mirrors are capable of producing parallel beams of light such as those arising from the headlamps of a car?
A. Cylindrical mirrors
B. Parabolic mirrors
C. Spherical mirrors
D. Plane mirrors.
3. A person can focus an object only when it lies within 200cm from him. Which spectacles should be used to increase his maximum distance of distinct vision to infinity?
A. Concave lens B. Plane glasses
C. Binoculars D. Convex lens.

4. In which of the following material media would sound travel faster?
A. Water B. Oil C. Metal D. Gas.
5. Calculate the angle of minimum deviation for a ray which is refracted through an equiangular prism of refractive index 1.4.
A. 29° B. 60° C. 99° D. 90° .
6. What happens to the rays in a parallel beam of light?
A. They diverge as they travel.
B. They meet at infinity.
C. They intersect
D. They converge as they travel.
7. If u is the object distance and v the image distance, which of the following expressions gives the linear magnification produced by a convex lens of focal length f ?
A. $\frac{u}{v} + f$ B. $\frac{u}{f} - f$ C. $\frac{v}{f} - 1$ D. $\frac{v}{f} + 1$
8. A ray of light makes an angle of 35° with a plane mirror. What is the angle of reflection?
A. 55° B. 35° C. 70° D. 65°
9. The pitch of a sound note depends on
A. timbre B. harmonics C. quality
D. frequency.
10. If the angle between two vectors P and Q is 0° , the vectors are said to
A. be perpendicular B. be parallel
C. intersect at angle 60° .
D. intersect at angle 45° .
11. A machine whose efficiency is 60% has a velocity ratio of 5. If a force of 500N is applied to lift a load P, what is the magnitude of P?
A. 750N B. 4166N
C. 500N D. 1500N
12. A body of mass 4kg is acted on by a constant force of 12N for 3 seconds. The kinetic energy gained by the body at the end of the time is
A. 162J B. 144J C. 72J D. 81J
13. As the pressure of a fluid increases, its viscosity
A. decreases B. remains constant
C. increases then decreases
D. increases.
14. I. Jet-propelled aircraft
II. Rocket propulsion
III. The recoil of a gun
IV. A person walking.
Which of the above is based on Newton's third law of motion?
A. I, II, III and IV B. I and III only
C. I and II only
D. I, II and III only.
15. In a hydraulic press, a force of 40N is applied on the effort piston of area 0.4m^2 . If the force exerted on the load piston is 400N, the area of the large piston is
A. 8m^2 B. 4m^2 C. 2m^2 D. 1m^2
16. A 100kg box is pushed along a road with a force of 500N. If the box moves with a uniform velocity, the coefficient of friction between the box and the road is
A. 0.5 B. 0.4 C. 1.0 D. 0.8
17. The earth is four times the size of the moon and the acceleration due to gravity on the earth is 80 times that on the moon. The ratio of the mass of the moon to that of the earth is
A. 1 : 320 B. 1 : 1280
C. 1 : 80 D. 1 : 4
- 18.

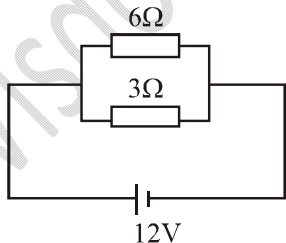


The diagram above shows forces 4N, 6N, 10N and 8N which act at a point O in the directions indicated. The net horizontal force is

- A. $7\sqrt{3}$ N B. 17N C. $\sqrt{3}$ N D. 13N
19. A radioisotope has a decay constant of 10^{-7}s^{-1} . The average life of the radioisotope is
 A. $6.93 \times 10^8\text{s}$ B. $1.00 \times 10^{-7}\text{s}$
 C. $1.00 \times 10^7\text{s}$ D. $6.93 \times 10^7\text{s}$
20. A moving coil galvanometer has a full-scale deflection of 3A equivalent to 30° deflection. The sensitivity of the instrument is
 A. 10.0 B. 33.0 C. 90.0 D. 0.1
21. The binding energy of helium ${}^4_2\text{He}$ is
 A. 2.017 U B. 0.033 U C. 4.033 U
 D. 0.330 U
 [atomic mass of proton = 1.00783 U,
 atomic mass of neutron = 1.00867 U]
22. In a tuned radio receiver, L, C series circuit for resonance, the inductive and capacitive reactance X_L and X_C respectively are related as
 A. $X_L = \frac{1}{X_C}$ B. $X_L = \frac{1}{2} X_C$
 C. $X_L = X_C$ D. $X_L = 2X_C$
23. The particle and wave nature of matter are demonstrated in the equation
 A. $\lambda = \frac{h}{p}$ B. $\lambda = \frac{c}{f}$
 C. $\lambda = 2d \sin \theta$ D. $\lambda = \frac{hc}{E}$
24. For semi-conductors to have negative temperature coefficient of resistance implies that
 A. they have electrons and holes at high temperatures.
 B. their resistance is constantly changing with temperature.
 C. their resistance increases with temperature
 D. their resistance decreases with temperature.
25. Fluorescent tubes produce light by the
 A. refraction of light by gas molecules
 B. excitation of gas molecules.
 C. conduction of solar energy
 D. thermal agitation of electrons in the tube.
26. In a reversed biased junction diode, current flows in by
 A. electrons alone
 B. majority carriers.
 C. minority carriers.
 D. positive holes alone.
27. The energy stored in an inductor of inductance 5mH when a current of 6A flows through it is
 A. 1.8×10^{-2} J B. 9.0×10^{-3} J
 C. 1.4×10^{-2} J D. 9.0×10^{-2} J
28. X-rays can be used in the study of crystal structures because they
 A. have an extremely short wavelength.
 B. have a very long-reaching wavelength.
 C. are very fast.
 D. are invisible.
29. An a.c. circuit of e.m.f. 12V has a resistor of resistance 8Ω connected in series to an inductor of inductive reactance 16Ω and a capacitor of

- capacitive reactance 10Ω . The current flowing in the circuit is
 A. 1.4A B. 14.0A C. 1.2A D. 12.0A
30. A generator-manufacturing company was contracted to produce an a.c. dynamo but inadvertently produced a d.c. dynamo. To correct this error, the
 A. commutator should be replaced with slip rings.
 B. commutator should be replaced with split rings.
 C. Armature coil should be made of aluminium.
 D. Armature coil should be made of silver.
31. Transverse waves can be distinguished from longitudinal waves using the characteristic of
 A. diffraction B. polarization
 C. reflection D. refraction.
32. A man exerts a pressure of $2.8 \times 10^3 \text{ Nm}^{-2}$ on the ground and has $4 \times 10^{-2} \text{ m}^2$ of his feet in contact with the ground. The weight of the man is
 A. 112N B. 140N C. 102N D. 140N
33. When left in a freezer, a bottle full of water cracks on freezing into ice because of the
 A. decrease in the volume of water.
 B. contraction of the bottle.
 C. expansion of the bottle.
 D. increase in the volume of water.
34. The change in volume when 450kg of ice is completely melted is
 A. 0.05m^3 B. 0.45m^3
 C. 4.50m^3 D. 0.50m^3
 [Density of ice = 900 kgm^{-3} ;
 Density of water = 1000 kgm^{-3}]
35. If a force of 50N stretches a wire from 20m to 20.01m, what is the amount of force required to stretch the same material from 20m to 20.05m?
 A. 100N B. 50N C. 250N D. 200N.
36. Tea pots are often silver-coated to prevent heat loss by
 A. convection and conduction
 B. radiation only
 C. conduction only
 D. convection only
37. 
 The phase difference between waves P and Q in the diagram above is
 A. $\frac{\pi}{2}$ B. 2π C. $\frac{\pi}{4}$ D. π .
38. Metal rods of length 20m each are laid end to end to form a bridge at 25°C . What gap will be provided between consecutive rails for the bridge to withstand 75°C ?
 A. 0.22m B. 0.25m C. 0.02m
 D. 0.20m
39. A 50W electric heater is used to heat a metal block of mass 5kg. If in 10 minutes, a temperature rise of 12°C is achieved, the specific heat capacity of the metal is
 A. $500 \text{ J kg}^{-1} \text{ K}^{-1}$ B. $130 \text{ J kg}^{-1} \text{ K}^{-1}$
 C. $390 \text{ J kg}^{-1} \text{ K}^{-1}$ D. $400 \text{ J kg}^{-1} \text{ K}^{-1}$
40. I. Wavelength
 II. Medium of propagation
 III. Wave velocity
 IV. Frequency.
 V. Energy.
 Which of the above are used for characterizing waves?
 A. I, II and V B. III, IV and V.

- C. I and IV. D. I, III and IV.
41. The instrument used for securing a large number of similar charges by induction is called
A. capacitor B. electrophorus
C. electroscope D. proof-plane
42. A steady current of 2A flows in a coil of emf 12V for 0.4s. A back emf of 3V was induced during this period. The stored energy in the loop that can be utilized is
A. 7.2J B. 12.0J C. 2.4J D. 9.6J
43. If 16mA of current flows through a conductor in one second, the number of electrons transported per second is
A. 1.00×10^{20} B. 1.00×10^{17}
C. 2.56×10^{-17} D. 2.56×10^{-18}
44. The difference between X-rays and gamma rays is that
A. X-rays arise from energy changes in the electronic structure of atoms while gamma rays come from the nucleus.
B. X-rays are electromagnetic radiations while gamma rays are negatively charged radiations.
C. X-rays have higher frequencies than gamma rays.
D. X-rays are more penetrating than gamma rays.
- 45.



In the diagram above, the ratio of the electric power dissipated in the 6Ω and 3Ω resistors respectively is
A. 2 : 3 B. 1 : 2 C. 1 : 3 D. 2 : 1

46. To protect a material from the influence of an external magnetic field, the material should be kept in a
A. square steel ring
B. loop of copper wire
C. triangular zinc ring
D. soft iron ring.
47. Which of the following is an electrolyte?
A. Grape juice B. Sugar solution
C. Alcohol D. Paraffin
48. Electrical appliances in homes are normally earthed so that
A. both the a.c. and d.c. sources can be used
B. a person touching the appliances is safe from electric shock.
C. the appliances are maintained at a higher p.d. than the earth.
D. the appliances are maintained at a lower p.d. than the earth.
49. A cell whose internal resistance is 0.5Ω delivers a current of 4A to an external resistor. The lost voltage of the cell is
A. 1.250V B. 8.000V
C. 0.125V D. 2.000V
50. Given three capacitors 0.3μF, 0.5μF and 0.2μF, the joined capacitance when arranged to give minimum capacitance is
A. 0.3 μF B. 1.0 μF C. 0.1 μF
D. 0.5 μF

2004 Solutions

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

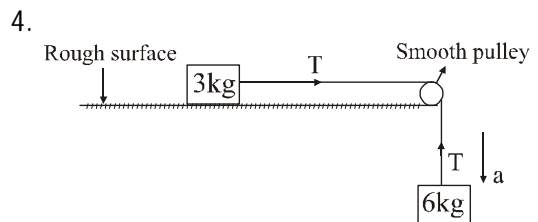
8. Option B.
9. Option D.
10. Option B.
11. Option D.
12. Option A.
13. Option D.
14. Option A.
15. Option B.
16. Option A.
17. Option B.
18. Option D.
19. Option A.
20. Option A.
21. Option B.
22. Option C.
23. Option A.
24. Option D.
25. Option B.
26. Option C.
27. Option D.
28. Option A.
29. Option C.
30. Option A.
31. Option B.
32. Option A.
33. Option D.
34. Option A.
35. Option C.
36. Option B.
37. Option A.
38. Option C.
39. Option A.
40. Option D.
41. Option B.
42. Option A.
43. Option B.
44. Option A.
45. Option B.
46. Option D.
47. Option A.

48. Option B.
49. Option D.
50. Option C.

UME 2005 Type 4 Questions

1. The pair of physical quantities consisting of vectors only are
 - A. displacement and torque
 - B. momentum and power.
 - C. acceleration and speed.
 - D. velocity and distance.
2. A motorcyclist traveling at 30ms^{-1} starts to apply his brakes when he is 50m from the traffic light that had just turned red. If he reached the traffic light, his deceleration is
 - A. 18 ms^{-2}
 - B. 10 ms^{-2}
 - C. 9 ms^{-2}
 - D. 5 ms^{-2}
3. An object is projected from a height of 80m above the ground with a velocity of 40ms^{-1} at an angle of 30° to the horizontal. The time of flight is
 - A. 16s
 - B. 10s
 - C. 8s
 - D. 4s

[$g = 10\text{ms}^{-2}$]

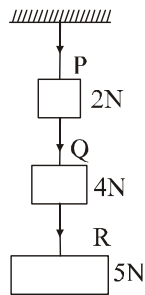


- In the figure above, the coefficient of static friction is 0.5. If the tension in the string is T, the acceleration of the system in motion is
- A. 3 ms^{-2}
 - B. 5 ms^{-2}
 - C. 9 ms^{-2}
 - D. 15 ms^{-2}

[$g = 10\text{ ms}^{-2}$]

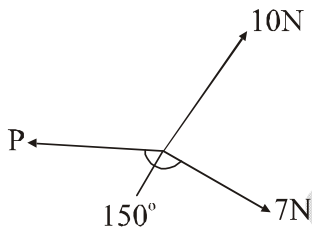
5. A force of 200N acts between two objects at a certain distance apart. The value of the force when the distance is halved is
A. 800N B. 400N C. 200N D. 100N

6.



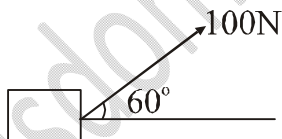
If the system above is in equilibrium, the tension in the string Q is
A. 4N B. 6N C. 9N D. 11N.

7.



The value of F in the figure above when in equilibrium is
A. 27N B. 20N C. 12N D. 10N

8.



In the figure above, the work done by the force of 100N inclined at an angle of 60° to the object dragged horizontally to a distance of 8m is
A. 100J B. 400J C. 600J D. 800J

9. In an ideal wheel and axle system, R stands for the radius of the wheel and r

is the radius of the axle. The mechanical advantage is

A. $\frac{r}{R}$ B. $\frac{R}{r}$ C. $\left(\frac{R}{r}\right)^2$ D. $\left(\frac{r}{R}\right)^2$

10. An elastic material has length of 36cm when a load of 40N is hung on it and a length of 45cm when a load of 60N is hung on it. The original length of the string is
A. 20cm B. 18cm C. 15cm D. 12cm

11. Two liquids L_1 and L_2 are contained in a U-tube. The height and the density of L_1 are 8cm and 10^3 kgm^{-3} respectively. If the density of L_2 is 800 kgm^{-3} , its height measured from the same level is
A. 16cm B. 12cm C. 10cm D. 8cm.

12. A body of mass 36kg falls through a viscous liquid which offers a drag force of 260N on the body. The upthrust on the body at terminal velocity is
A. 50N B. 100N C. 310N D. 620N
[$g = 10 \text{ ms}^{-2}$]

13. A 3 m^3 volume of liquid W of density 200 kgm^{-3} is mixed with another liquid of volume 7 m^3 and density 150 kgm^{-3} . The density of the mixture is
A. 350 kgm^{-3} B. 265 kgm^{-3}
C. 165 kgm^{-3} D. 100 kgm^{-3}

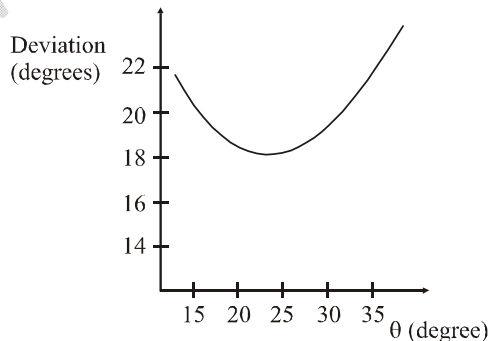
14. I. Reproducibility II. Sensitivity
III. High thermal capacity
IV. High accuracy.

The qualities of a good thermometer include

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

15. When very hot water is poured into two identical thin and thick glass tumblers in

- equal volumes, the thick one cracks because
- glass is a good conductor of heat.
 - of the uneven expansion of glass.
 - glass is a crystal.
 - of the even expansion of glass.
- 10^6 J of heat is required to boil off completely 2kg of a certain liquid. Neglecting heat loss to the surroundings, the latent heat of vaporization of the liquid is
 A. $5.0 \times 10^6 \text{ Jkg}^{-1}$ B. $2.0 \times 10^6 \text{ Jkg}^{-1}$
 C. $5.0 \times 10^5 \text{ Jkg}^{-1}$ D. $2.0 \times 10^5 \text{ Jkg}^{-1}$
 - The process whereby a liquid turns spontaneously into vapour is called
 A. boiling B. evaporation
 C. sublimation D. relegation.
 - When the temperature difference between the wet and dry bulbs of a hygrometer is high, this indicates that
 A. the relative humidity is high.
 B. the relative humidity is low.
 C. it is about to rain.
 D. there is plenty of sunshine
 - The process whereby the molecules of different substances move randomly is called
 A. osmosis B. capillarity
 C. diffusion D. surface tension.
 - I. Melting II. Boiling
 III. Refraction IV. Conduction.
 Which combination of the above is evident of the molecular nature of matter?
 A. I, II and III only B. II, III and IV only
 C. I, II and IV only D. I, III and IV only.
 - The velocity of sound in air will be doubled if its absolute temperature is
 A. halved B. doubled C. quadrupled
 D. constant.
 - Marching soldiers crossing a suspension bridge are usually advised to break their steps to avoid damaging the bridge owing to
 A. resonance B. swinging C. vibration
 D. oscillation.
 - The sharpness of the boundary of the shadow of an object is determined by the
 A. nature of the object
 B. opacity of the object.
 C. rays of light passing through the object
 D. intensity of light striking the object.
 - A real image three times the size of an object is formed 24cm from a converging mirror. What is the focal length of the mirror?
 A. 6cm B. 8cm C. 12cm D. 16cm

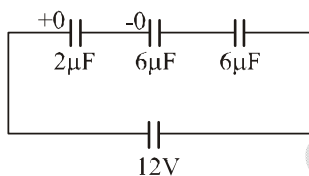


The figure above shows a plot of angles of deviation through a glass prism when light is incident at θ degrees on the prism. The incident angle that produces the minimum deviation is

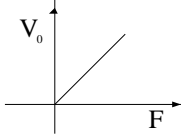
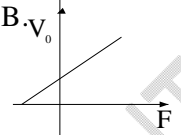
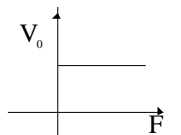
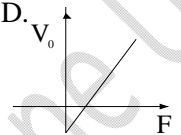
- 18°
- 20°
- 25°
- 35°

- A thin converging lens has a power of 4.0 diopters. Determine its focal length.
 A. 0.03m B. 0.25m C. 2.50m D. 5.00m
- Satellite communication network makes use of

- A. sound wave B. radio wave
C. infra-red rays D. visible light.
28. If the distance between two point charges is increased by a factor of four, the magnitude of the electrostatic force between them will be
A. 4 times its former value
B. $\frac{1}{2}$ of its former value.
C. $\frac{1}{4}$ of its former value.
D. $\frac{1}{16}$ of its former value.
29. The electric field intensity in a place where a charge of 10^{-10}C experiences a force of 0.4N is
A. $8.0 \times 10^9\text{NC}^{-1}$ B. $4.0 \times 10^9\text{NC}^{-1}$
C. $4.0 \times 10^{-11}\text{NC}^{-1}$ D. $8.0 \times 10^{-12}\text{NC}^{-1}$
- 30.

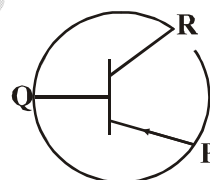


- The figure above shows three capacitors, $2\mu\text{F}$, $3\mu\text{F}$ and $6\mu\text{F}$ connected in series. If the p.d. across the system is 12V , the p.d. across the $6\mu\text{F}$ capacitor is
A. 2V B. 4V C. 6V D. 12V .
31. A car battery rated 45AH is charged with a charger whose rating is 2.5A . How long will it take to charge the battery fully?
A. 25hrs B. 20hrs
C. 18hrs D. 10hrs
32. The resistance of a piece of wire of length 20m and cross-sectional area $8 \times 10^{-6}\text{m}^2$ is
A. 0.5Ω B. 1.0Ω C. 5.0Ω D. 10.0Ω
33. An electric device is rated 2000W , 250V . The correct fuse rating of the device is
A. 6A B. 7A C. 8A D. 9A
34. Two charged particles are projected into a region where there is a magnetic field perpendicular to their velocities. If the charges are deflected in opposite directions, which of the following statements is true of the charges?
A. The charges are electrically neutral
B. The charges must be of opposite signs.
C. The charges are of the same sign.
D. Positive charges are more in number.
35. The North pole of a magnet can never be separated from the South pole because of a property known as
A. magnetic monopole
B. magnetic dipole
C. magnetic quadrupole
D. magnetic octopole.
36. A proton moving with a speed of $1.0 \times 10^6 \text{ms}^{-1}$ through a magnetic field of 1.0T experiences a magnetic force of magnitude $8.0 \times 10^{-14}\text{N}$. The angle between the proton's velocity and the field is
A. 90° B. 60° C. 45° D. 30° .
37. A transformer is rated 240V . If the primary coil is 4000 turns and the secondary voltage 12V , determine the number of turns in the secondary coil.
A. 100 B. 150 C. 200 D. 250
38. If two inductors of inductances 3H and 6H are arranged in series, the total inductance is
A. 0.5H B. 2.0H C. 9.0H D. 18.0H
39. In an a.c. circuit that contains only a capacitor, the voltage lags behind the current by

- A. 30° B. 60° C. 90° D. 180°
40. The charge carriers in gases are
A. electrons only B. ions only
C. electrons and ions
D. electrons and holes.
41. ${}_{92}^{235}\text{U} + {}_0^1\text{n} \rightarrow {}_{56}^{144}\text{Ba} + {}_{36}^{90}\text{Br} + 2\text{X}$
In the reaction above, X is
A. proton B. neutron C. electron
D. neutrino
42. The amount of energy released when 0.5kg of uranium is burnt completely is
A. $1.5 \times 10^8\text{J}$ B. $4.5 \times 10^8\text{J}$
C. $1.5 \times 10^{16}\text{J}$ D. $4.5 \times 10^{16}\text{J}$
43. In photoelectric effect, which of the following graphs correctly represents the graph stopping potential V_0 against frequency f of incident light?
- A. 
- B. 
- C. 
- D. 
44. The time it will take a certain radioactive material with a half-life of 50 days to reduce to $\frac{1}{32}$ of its original number is
A. 150 days B. 200 days C. 250 days
D. 300 days.
45. The ray which causes gas molecules to glow is known as
A. gamma ray B. molecular ray
C. cathode ray D. anode ray.
46. Which of the following materials is a conductor?
A. Sodium B. Glass C. Plastic

- D. Wax.
47. A silicon material is dropped with an element of a certain group and an n-type semi-conductor is formed. The most likely group of the element is
A. I B. II C. III D. V.
48. When impurities are added to semi-conductors, the conductivity of the semi-conductor
A. increases B. decreases
C. remains constant.
D. increase then decreases.
49. The current in a reverse-biased junction is due to
A. majority carriers B. holes
C. minority carriers D. electrons.

50.



- In the circuit diagram of a transistor above, the terminals P, Q and R represent
A. base, emitter and collector.
B. base, collector and emitter.
C. emitter, base and collector.
D. collector, emitter and base.

2005 Solutions

- Option A.
- Option C.
- Option C.
- Option B.
- Option A.
- Option C.
- Option B.
- Option B.
- Option B.

10. Option B.
11. Option C.
12. Option B.
13. Option C.
14. Option C.
15. Option B.
16. Option C.
17. Option B.
18. Option B.
19. Option C.
20. Option C.
21. Option C.
22. Option A.
23. Option D.
24. Option A.
25. Option C.
26. Option B.
27. Option B.
28. Option D.
29. Option B.
30. Option A.
31. Option C.
32. Option B.
33. Option C.
34. Option B.
35. Option B.
36. Option D.
37. Option C.
38. Option C.
39. Option C.
40. Option C.
41. Option B.
42. Option D.
43. Option D.
44. Option C.
45. Option C.
46. Option A.
47. Option D.
48. Option A.
49. Option C.

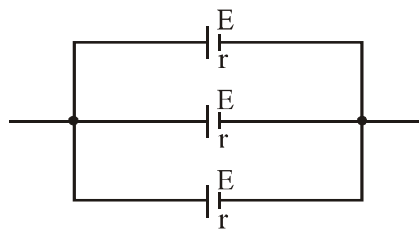
50. Option C.

UTME 2007

Questions - Type Y

1. A glass plate 0.9cm thick has a refractive index of 1.50. How long does it take for a pulse of light to pass through the plate?
A. 3.0×10^{-11} s B. 4.5×10^{-11} s
C. 3.0×10^{-10} s D. 4.5×10^{-10} s
2. The fundamental frequency of a plucked wire under a tension of 400N is 250 Hz. When the frequency is changed to 500 Hz at constant length, the tension is
A. 40N B. 160N C. 400N D. 1600N
3. The production of pure spectrum could easily be achieved using a
A. triangular prism only
B. triangular prism with two concave lenses
C. triangular prism with two convex lenses
D. glass prism with a pin.
4. I. They should be identical.
II. They should originate from the same source.
III. they should be coherent.
IV. They should be monochromatic.
From the statements above, the conditions for two waves to interfere are
A. I, III and IV only
B. I, II, III and IV
C. I, II and III only
D. II, III and IV only.
5. The instrument used by designers to obtain different colour patterns is called
A. episcopes B. periscopes
C. kaleidoscope D. sextant

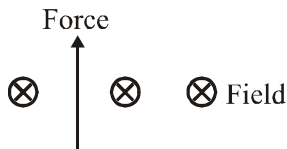
6. When an object is placed between the principal focus and the optical centre of a convex lens, it could be used as a
 A. reflecting lens
 B. compound microscope
 C. projector
 D. simple microscope.
7. In a large telecommunications auditorium, perforated absorbent materials are used to line the ceiling so as to
 A. reduce the reverberation of sound in the hall.
 B. reduce the height of the ceiling from the floor.
 C. increase the reverberation of sound in the hall.
 D. increase the amount of echo in the hall.
8. The phenomenon of light bending round an obstacle is
 A. reflection B. polarization
 C. refraction D. diffraction
9. The energy E of a photon and its wavelength are related by $E\lambda = X$. The numerical value of X is
 A. 1.99×10^{-27} B. 6.60×10^{-26}
 C. 1.99×10^{-25} D. 6.60×10^{-25}
 [$h = 6.63 \times 10^{-34}$ Js, $c = 3 \times 10^8$ ms $^{-1}$].
10. A radioactive substance has a half-life of 20 days. What fraction of the original radioactive nuclei will remain after 80 days?
 A. $\frac{1}{16}$ B. $\frac{1}{8}$ C. $\frac{1}{4}$ D. $\frac{1}{32}$
11. Silicon doped with aluminium and germanium doped with arsenic become
 A. n-type semi-conductors
 B. p-type semi-conductors
 C. n- and p-types respectively
 D. p- and n-types respectively.
12. A photon of wavelength 6.0×10^{-7} behaves like a particle of a certain mass. The value of that mass is
 A. 1.1×10^{-35} kg B. 2.2×10^{-27} kg
 C. 3.5×10^{-36} kg D. 2.2×10^{-35} kg
 [$h = 6.63 \times 10^{-34}$ Js, $c = 3 \times 10^8$ ms $^{-1}$].
13. During the nuclear reactions described by ${}_{92}^{235}\text{W} \rightarrow {}_{93}^{235}\text{X} \rightarrow {}_{91}^{231}\text{Y}$, the particles emitted are respectively
 A. β and β B. β and α C. α and β
 D. α and α .
14. The bond that forms a semi-conductor is
 A. ionic B. metallic C. covalent
 D. electrovalent.
15. The instrument that measures both a.c. and d.c. is
 A. an inverter B. a current balance.
 C. a moving coil ammeter.
 D. a moving iron ammeter.
16. Lenz's law is a law of the conservation of
 A. energy B. momentum
 C. electric D. electric charge.
- 17.



- Three cells each of e.m.f 1.5V and internal resistance 2.5Ω are connected as shown in the diagram above. Find the net e.m.f. and the internal resistance.
 A. 4.5V, 7.50Ω B. 4.5V, 0.83Ω
 C. 1.5V, 7.50Ω D. 1.5V, 0.83Ω

18. A 120V, 60W lamp is to be operated on 220V a.c. supply mains. Calculate the value of non-inductive resistance that would be required to ensure that the lamp is run on correct value.
A. 500Ω B. 300Ω C. 200Ω D. 100Ω

19.



In the diagram above, if the magnetic field points into the paper and the force on a current-carrying conductor points upwards, what is the direction of the current?

- A. Downwards B. Right
C. Left D. Upward.
20. The instantaneous value of the induced e.m.f. as a function of time is $\epsilon = \epsilon_0 \sin \omega t$ where ϵ_0 is the peak value of the e.m.f. The instantaneous value of the e.m.f, one quarter of the period, is
A. ϵ_0 B. $\frac{\epsilon_0}{2}$ C. $\frac{\epsilon_0}{4}$ D. 0
21. 118.8 cm² surface of the copper cathode of a voltameter is to be coated with 10⁻⁶m thick copper of density 9 x 10³ kgm⁻³. How long will the process run with 10A constant current?
A. 10.8 min B. 20.0 min.
C. 5.4 min. D. 15.0 min.
[e.c.e. of copper = 3.3 x 10⁻⁷ kg C⁻¹].
22. A conductor has a diameter of 1.00mm and length 2.00m. If the resistance of the material is 0.1Ω, its resistivity is
A. 3.93 x 10⁻⁸ Ωm B. 3.93 x 10⁻⁶ Ωm
C. 2.55 x 10² Ωm D. 2.55 x 10² Ωm
23. A charge 50μC has an electric field strength of 360 NC⁻¹ at a certain point.

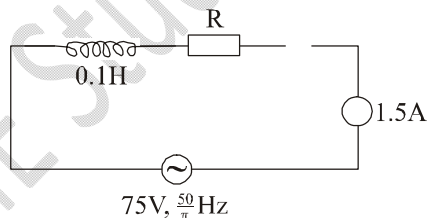
The electric field strength due to another charge 120μC. kept at the same distance apart and in the same medium is

- A. 18 NC⁻¹ B. 144 NC⁻¹
C. 150 NC⁻¹ D. 864 NC⁻¹

24. Two long parallel wires X and Y carry currents 3A and 5A respectively. If the force experienced per unit length by X is 5 x 10⁻⁵N, the force per unit length experienced by wire Y is

- A. 3 x 10⁻⁵N B. 3 x 10⁻⁶N
C. 5 x 10⁻⁴N D. 5 x 10⁻⁵N

25.



From the diagram, the inductive reactance and the resistance R are respectively

- A. 10Ω and 50Ω B. 20Ω and 50Ω
C. 25Ω and 50Ω D. 50Ω and 45Ω

26. A 40 kW electric cable is used to transmit electricity through a resistor of resistance 2.0Ω at 800V. The power loss as internal energy is

- A. 5.0 x 10²W B. 4.0 x 10³W
C. 5.0 x 10³W D. 4.0 x 10²W

27. If two charged plates are maintained at a potential difference of 3 kV, the work done in taking a charge of 600μC across the field is

- A. 9.0J B. 0.8J C. 18.0J D. 1.8J

28. The ratio of the coefficient of linear expansion of two metals $\frac{\alpha_1}{\alpha_2}$ is 3 : 4. If,

when heated through the same

temperature change, the ratio of the increase in length of the two metals,

$\frac{e_1}{e_2}$ is 1 : 2, the ratio of the original

length $\frac{l_1}{l_2}$ is

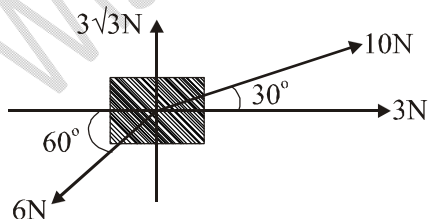
A. $\frac{2}{3}$ B. $\frac{8}{3}$ C. $\frac{3}{8}$ D. $\frac{3}{2}$

29. I. Mass
II. Density
III. Temperature
IV. Nature of substance
Which of the above affect diffusion?
A. I, II and IV only
B. II, III and IV only
C. I, II, III and IV.
D. I and II only.
30. A string of length 4m is extended by 0.02m when a load of 0.4 kg is suspended at its end. What will be the length of the string when the applied force is 15N?
A. 5.05m B. 6.08m C. 4.05m
D. 4.08m. [g = 10ms⁻²].
31. I. Use a liquid with a high melting point
II. Use a liquid of high volume expansivity
III. Use a capillary tube of large diameter.
Which of the above best describes how the sensitivity of a liquid-in-glass thermometer can be enhanced?
A. II only B. II and III only
C. I only D. I and III only.
32. The blade of a hoe feels colder to touch in the morning than the wooden handle because the
A. handle contains stored energy in form of heat.

- B. blade is placed at a lower temperature than the handle.
C. handle is a better conductor of heat than the blade.
D. blade is a better conductor of heat than the handle.

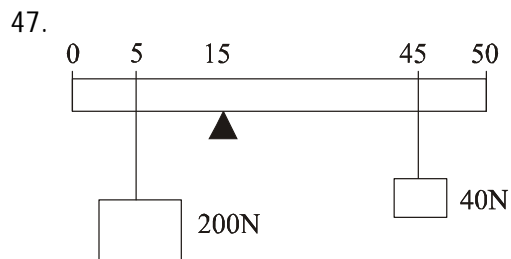
33. Which of the following gas laws is equivalent to the work done?
A. Pressure Law
B. Van der Waal's Law
C. Boyle's Law D. Charles' Law
34. A piece of iron weighs 250N in air and 200N in a liquid of density 1000 kgm⁻³. The volume of the iron is
A. 2.0 x 10⁻³m³ B. 2.5 x 10⁻³m³
C. 4.5 x 10⁻³m³ D. 5.0 x 10⁻³m³
[g = 10ms⁻²]
35. I. Increase the melting point of the liquid.
II. Increase the boiling point of the liquid.
III. decrease the melting point of the liquid.
IV. decrease the boiling point of the liquid.
Which of the statements above about the effects of increase in pressure in a liquid are correct?
A. II and III only
B. III and IV only
C. I and III only
D. I and II only.
36. A blacksmith heated a metal whose cubic expansivity is 6.3 x 10⁻⁶K⁻¹. The area expansivity is
A. 6.3 x 10⁻⁶K⁻¹ B. 4.2 x 10⁻⁶K⁻¹
C. 2.1 x 10⁻⁶K⁻¹ D. 2.0 x 10⁻⁶K⁻¹
37. The differences observed in solids, liquids and gases may be accounted for by

- A. their relative masses
 B. their melting points
 C. the different molecules in each of them.
 D. the spacing and forces acting between the molecules.
38. A reservoir 500m deep is filled with a fluid of density 850kg^{-3} . If the atmospheric pressure is $1.05 \times 10^5 \text{Nm}^{-2}$, the pressure at the bottom of the reservoir is
 A. $4.36 \times 10^6 \text{Nm}^{-2}$ B. $4.25 \times 10^6 \text{Nm}^{-2}$
 C. $4.72 \times 10^6 \text{Nm}^{-2}$ D. $4.28 \times 10^6 \text{Nm}^{-2}$
 [g = 10ms^{-2}]
39. A clinical thermometer is different from other mercury in glass thermometers owing to
 A. its long stem.
 B. the constriction on its stem.
 C. its wide range of temperature.
 D. the grade of mercury used in it.
40. 2 kg of water is heated with a heating coil which draws 3.5A from a 200V mains for 2 minutes. What is the increase in temperature of the water?
 A. 25°C B. 15°C C. 10°C D. 30°C
41. A boy drags a bag of rice along a smooth horizontal floor with a force of 2N applied at an angle of 60° to the floor. The work done after a distance of 3m is
 A. 6J B. 5J C. 4J D. 3J



The figure above shows 4 forces 3N, 10N, $3\sqrt{3}$ N and 6N acting on a particle P. The resultant of the four forces is
 A. $10\sqrt{3}$ N B. 10N C. $5\sqrt{3}$ N D. 5N.

43. Two spheres of masses 5.0 kg and 10.0 kg are 0.3m apart. Calculate the force of attraction between them.
 A. $3.71 \times 10^{-8}\text{N}$ B. $3.57 \times 10^{-2}\text{N}$
 C. $4.00 \times 10^2\text{N}$ D. $3.50 \times 10^{-10}\text{N}$
 [G = $6.67 \times 10^{-11}\text{Nm}^2\text{kg}^{-2}$]
44. A car of mass 1500 kg goes round a circular curve of radius 50m at a speed of 40ms^{-1} . The magnitude of the centripetal force on the car is
 A. $1.2 \times 10^2\text{N}$ B. $1.2 \times 10^3\text{N}$
 C. $4.8 \times 10^3\text{N}$ D. $4.8 \times 10^4\text{N}$
45. The unit of moment of a couple can be expressed in
 A. Nm B. Nm^{-1} C. Nm^2 D. Nm^{-2}
46. A machine has a velocity ratio of 4. If it requires 800N to overcome a load of 1600N, what is the efficiency of the machine?
 A. 2% B. 40% C. 50% D. 60%.



In the diagram above, a rod 50cm long of uniform cross-section is suspended horizontally on a fulcrum, F, by the action of the forces. What is the weight of the rod?

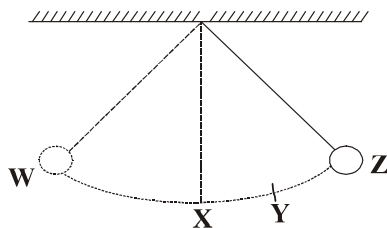
- A. 120N B. 200N C. 40N D. 80N.
48. A gramophone record takes 5s to reach its constant angular velocity of 4π

rads⁻¹ from rest. Find its constant angular acceleration.

- A. 20.0π rads⁻² B. 1.3π rads⁻²
 C. 0.08π rads⁻² D. 0.4π rads⁻²

49. A particle of weight 120N is placed on a plane inclined at an angle 30° to the horizontal. If the plane has an efficiency of 60%, what is the force required to push the weight uniformly up the plane?
 A. 210N B. 175N C. 100N D. 50N.

50.



From the diagram above, the bob of the pendulum has the fastest speed at
 A. W B. Z C. Y D. X.

2007 Answers

1. Option B.
2. Option D.
3. Option C.
4. Option C.
5. Option C.
6. Option D.
7. Option A.
8. Option D.
9. Option C.
10. Option A.
11. Option C.
12. Option C.
13. Option B.
15. Option D.
16. Option A.
17. Option D.

18. Option A.
19. Option C.
20. Option C.
21. Option C.
22. Option A.
23. Option D.
24. Option D.
25. Option A.
26. Option C.
27. Option D.
28. Option A.
29. Option B.
30. Option D.
31. Option A.
32. Option D.
33. Option C.
34. Option D.
35. Option A.
36. Option B.
37. Option D.
38. Option A.
39. Option B.
40. Option C.
41. Option D.
42. Option B.
43. Option A.
44. Option D.
45. Option A.
46. Option C.
47. Option D.
48. Option C.
49. Option C.
50. Option D.

UTME 2008

1. The dimensions of electromotive force are
 A. $ML^2T^{-3}I^{-1}$ B. $ML^2T^{-3}I^{-2}$
 C. $M^2LT^2I^{-1}$ D. $M^2L^2T^{-1}I^{-1}$
2. **I. Force(N)**

II. Torque (Nm^{-1})

III. Current (A)

IV. Power (W)

Which of the above are the correct S. I.

Units of the quantities indicated?

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

3. The resultant of two forces 12N and 5N is 13N. What is the angle between the two forces?

- A. 0° B. 45° C. 90° D. 180°

4. Which of the following is NOT a vector quantity?

- A. Altitude B. Acceleration
C. Displacement D. Weight

5. A force F is required to keep a 5kg mass moving round a cycle of radius 3.5m at a speed of 7ms^{-1} . What is the speed, if the force is tripled?

- A. 4.0ms^{-1} B. 6.6ms^{-1}
C. 12.1ms^{-1} D. 21.0ms^{-1}

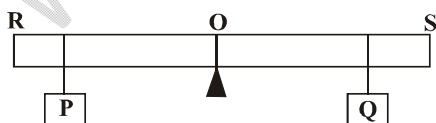
6. If a wheel 1.2m in a diameter rotates at one revolution per second, calculate the velocity of the wheel.

- A. 3.6ms^{-1} B. 3.8ms^{-1}
C. 4.0ms^{-1} D. 7.5ms^{-1}

7. A body of mass 4 kg resting on a smooth horizontal plane is simultaneously acted upon by two perpendicular forces 6N and 8N. Calculate the acceleration of the motion.

- A. 2.5ms^{-2} B. 3.0ms^{-2}
C. 4.0ms^{-2} D. 4.5ms^{-2}

8.



The diagram above shows a plank RS pivoted at its centre of gravity O and is in equilibrium with the weights P and Q. If a weight 2P is added to P, the plank will be in equilibrium again by

- A. moving Q nearer to O
B. moving P nearer to O
C. adding a weight Q to O
D. moving P further away from O.

9. I. **All the three forces must be concurrent.**

II. **The upward force is equal to the downward force.**

III. **The algebraic sum of the moment about any point must be zero.**

Which of the above conditions must hold for a body acted upon by a system of three coplanar forces in equilibrium?

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

10. What is the frequency of vibration if the balance wheel of a wristwatch makes 90 revolutions in 25s?

- A. 0.01Hz B. 0.04Hz
C. 2.27Hz D. 3.60Hz

11. If a body of mass 5kg is thrown vertically upwards with velocity u , at what height will the potential energy equal to the kinetic energy?

- A. $h = \frac{u^2}{g}$ B. $h = \frac{u^2}{4g}$
C. $h = \frac{2u^2}{g}$ D. $h = \frac{u^2}{2g}$

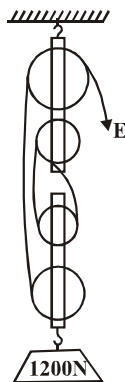
12. Counting of currency notes with moist fingers is based on the principles of

- A. diffusion B. cohesion
C. adhesion D. viscosity

13. A motorcycle of mass 100kg moves round in a circle of radius 10m with a velocity of 5ms^{-1} . Find the coefficient of friction between the road and the tyres.

A. 25.00 B. 2.50 C. 0.50
D. 0.25 $[g \approx 10\text{ms}^{-2}]$

14.



The efficiency of the pulley system shown above is 80%. Find the effort E required to lift a load of 1200N.

A. 275N B. 325N
C. 375N D. 573N.

15. A spring of force constant 500Nm^{-1} is compressed such that its length shortens by 5cm. The energy stored in the spring is

A. 0.625J B. 6.250J
C. 62.500J D. 625.000J

16. In the Hare's apparatus, water rises to a height of 26.5cm in one limb. If a liquid rises to a height of 20.4cm in the other limb, what is the relative density of the liquid?

A. 0.8 B. 1.1 C. 1.2 D. 1.3

17. When cold water is poured on a can containing hot water, the can collapses because the

A. steam condenses and occupies the partial vacuum in the can

B. external air pressure counterbalances the pressure within the can

C. steam expands to occupy the vacuum remaining in the can

D. external pressure becomes greater than the pressure within the can

18. An empty density bottle weighs 2N. If it weighs 5N when filled with water and 4N when filled with olive oil, the relative density of olive oil is

A. $\frac{1}{3}$ B. $\frac{2}{3}$ C. $\frac{1}{5}$ D. $\frac{2}{5}$

19. The thermometric property of a thermocouple is the change in

A. equivalent resistance

B. electromotive force

C. colour

D. pressure.

20. During summer, the balance wheel of a clock expands. What effect does this have on the accuracy of the clock?

A. The clock gains time.

B. The accuracy of the clock is not affected.

C. The clock loses time.

D. The clock stops working.

21. A sealed flask contains 600cm^3 of air at 27°C and is heated to 35°C at constant pressure. The new volume is

A. 508cm^3 B. 516cm^3

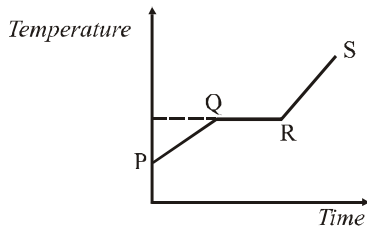
C. 608cm^3 D. 616cm^3

22. A block of aluminium is heated electrically by a 25W heater. If the temperature rises by 10°C in 5 minutes, the heat capacity of the aluminium is

A. 850JK^{-1} B. 750JK^{-1}

C. 650JK^{-1} D. 500JK^{-1}

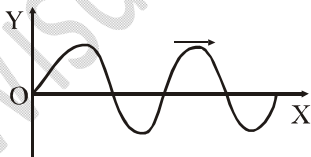
23.



The diagram above is the heating curve of a solid. QR is the

- A. melting region
 - B. boiling region
 - C. sublimation region
 - D. evaporating process
24. If the partial pressure of water vapour at 27°C is 18mm Hg and the saturated vapour pressure of the atmosphere at the same temperature is 24mm Hg, the relative humidity at this temperature is
- A. 25%
 - B. 33%
 - C. 75%
 - D. 82%
25. In a good thermos flask, the main cause of heat loss is
- A. conduction through the cork
 - B. the plastic base of the thermos flask
 - C. the silvered walls and shiny metals
 - D. the outer cover or jacket.
26. Given the progressive wave equation $y = 5 \sin (2000\pi t - 0.4x)$, calculate the wavelength.
- A. 12.4m
 - B. 15.7m
 - C. 17.5m
 - D. 18.6m

27.



The above figure shows the motion of a progressive wave along a string. The particle motion of the medium is in the direction

- A. parallel to OX

- B. parallel to OY

- C. 60° to OX

- D. 60° to OY.

28. The fundamental property of a propagating wave which depends only on the source and not the medium of propagation is the

- A. wavelength
- B. harmonics
- C. frequency
- D. velocity.

29. When the length of a vibrating string is reduced by one-third, its frequency becomes

- A. three times its former value
- B. twice its former value
- C. one-third of its former value
- D. one-sixth of its former value.

30. **I. Total internal reflection of light**

II. Conservation of light energy

III. Relative motion of the earth, sun and moon.

IV. Rectilinear propagation of light.

Which of the above is a phenomenon of total solar eclipse?

- A. I and IV only
- B. II and IV only
- C. I and III only
- D. III and IV only.

31. An object of height 4cm is placed in front of a cuboid pinhole camera of size 6cm. If the image formed is 2cm high, how far is the object from the pinhole?

- A. 3.0cm
- B. 8.0cm
- C. 12.0cm
- D. 16.0cm

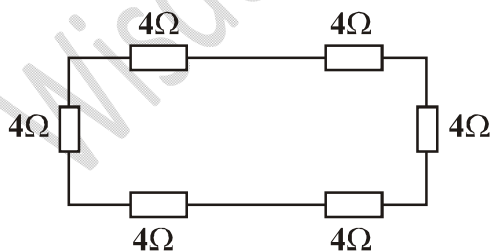
32. An object of height 5cm is placed at 20cm from a concave mirror of focal length 10cm. The image height is

- A. 20cm
- B. 15cm
- C. 10cm
- D. 5cm

33. Convex mirrors are used as driving mirrors because images formed are

- A. erect, virtual and diminished
 B. erect, real and diminished
 C. erect, virtual and magnified
 D. inverted, virtual and diminished.
34. If a convex lens of focal length 12cm is used to produce a real image four times the size of the object, how far from the lens must the object be placed?
 A. 10cm B. 15cm
 C. 20cm D. 25cm.
35. An object placed at the bottom of a well full of clear water appears closer to the surface due to
 A. diffraction B. reflection
 C. refraction D. polarization
36. In the microscope, the eyepiece lens merely acts as
 A. an inverter B. a refiner
 C. a diminisher D. a magnifier
37. An observer with normal eyes views an object with a magnifying glass of focal length 5cm. The angular magnification is
 A. -6 B. -5 C. 5 D. 6
 [least distance of distinct vision $D = 25\text{cm}$]
38. A short chain is sometimes attached to the back of a petrol tanker to
 A. generate more friction
 B. ensure the balancing of the tanker
 C. caution the driver when overspeeding
 D. conduct excess charges to the earth

39.



Find the effective resistance in the diagram above.

- A. 6Ω B. 12Ω C. 16Ω D. 24Ω

40. An electric generator has an e.m.f. of 240V and an internal resistance of 1Ω . If the current supplied by the generator is 20A when the terminal voltage is 220V, find the ratio of the power supplied to the power dissipated.

- A. 11 : 1 B. 1 : 11
 C. 12 : 11 D. 11 : 12

41. A generator is on daily use and in the process, ten 60W and five 40W tungsten bulbs are on for the same time interval. The energy consumed daily is

- A. 0.96kWh B. 1.92kWh
 C. 9.60kWh D. 19.20kWh

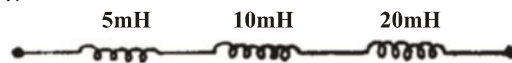
42. The d.c. generator has essentially the same components as the a.c. generator except the presence of

- A. slip-ring B. carbon brushes
 C. split ring D. armature

43. A step-down transformer has a power output of 50W and efficiency of 80%. If the mains supply voltage is 200V, calculate of the primary current of the transformer.

- A. 0.31A B. 3.20A
 C. 3.40A D. 5.00A

44.



Given three inductors of inductances 5mH, 10mH and 20mH connected in series, the effective inductance is

- A. 0.35mH B. 3.50mH C. 2.90mH
 D. 35.00mH

45. If electrons are accelerated from rest through a potential difference of 10kV, what is the wavelength of the associated electron?

- A. $1.22 \times 10^{-11}\text{m}$ B. $3.87 \times 10^{-10}\text{m}$
 C. $2.27 \times 10^{-11}\text{m}$ D. $2.27 \times 10^{-14}\text{m}$

[$m = 9.1 \times 10^{-31}\text{kg}$, $e = 1.6 \times 10^{-19}\text{C}$,

$$h = 6.6 \times 10^{-34} \text{Js}$$



In the equation above, the particle X is

- A. a proton B. a neutron
C. an α -particle D. a β -particle

47. Caesium has a work function of $3 \times 10^{-19} \text{J}$.
The maximum energy of liberated electrons when it is illuminated by light of frequency

$$6.7 \times 10^{14} \text{Hz is}$$

- A. $1.42 \times 10^{-19} \text{J}$ B. $3.00 \times 10^{-19} \text{J}$
C. $4.42 \times 10^{-19} \text{J}$ D. $7.42 \times 10^{-19} \text{J}$

$$[h = 6.6 \times 10^{-35} \text{Js}]$$

48. Zener diode is used for

- A. current amplification
B. power amplification
C. voltage regulation
D. energy conversion.

49. When a pure semiconductor is heated, its resistance

- A. increases B. decreases
C. remains the same
D. increases and then decreases.

50. I. **For current amplification**

II. **For voltage stabilization**

III. **For power amplification**

IV. **As a switch.**

Which of the above are the uses of a transistor?

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

6. Option B.

7. Option A.

8. Option B.

9. Option B.

10. Option D.

11. Option B.

12. Option C.

13. Option D.

14. Option C.

15. Option A.

16. Option D.

17. Option D.

18. Option B.

19. Option B.

20. Option C.

21. Option D.

22. Option B.

23. Option A.

24. Option C.

25. Option A.

26. Option B.

27. Option B.

28. Option C.

29. Option A.

30. Option D.

31. Option C.

32. Option D.

33. Option A.

34. Option B.

35. Option C.

36. Option D.

37. Option C.

38. Option D.

39. Option D.

40. Option C.

41. Option D.

42. Option C.

43. Option A.

44. Option D.

45. Option A.

2008 Answers

1. Option A.
2. Option D.
3. Option C.
4. Option A.
5. Option C.

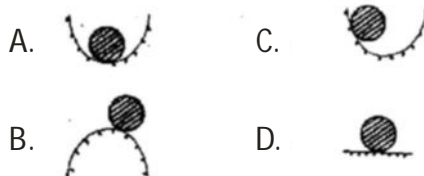
46. Option A.
 47. Option A.
 48. Option C.
 49. Option B.
 50. Option A.

UTME 2009

Questions

1. The values of x , y , and z respectively in the expression $M^x L^y T^z$ for the universal gravitational constant G are
 A. 2, -3, -2 B. -1, 3, -2
 C. -1, 2, -3 D. -2, -1, 3
2. **I. Diameter of a small ball bearing**
II. Thickness of a piece of paper.
III. Diameter of a measuring cylinder.
IV. Length of a piece of wire.
- Which of the above can be measured using a micrometer screw gauge?
 A. I, II and IV only B. I and II only
 C. II and III only D. III and IV only
3. An aircraft attempts to fly due north at 100kmh^{-1} . If the wind blows against it from east to west at 60kmh^{-1} , its resultant velocity is
 A. 117kmh^{-1} , $\text{N}31^\circ\text{E}$
 B. 127kmh^{-1} , $\text{N}31^\circ\text{E}$
 C. 117kmh^{-1} , $\text{N}31^\circ\text{W}$
 D. 127kmh^{-1} , $\text{N}31^\circ\text{W}$
4. What is the acceleration between two points on a velocity-time graph which has coordinates $(10\text{s}, 15\text{m s}^{-1})$ and $(20\text{s}, 35\text{m s}^{-1})$?
 A. 1.75ms^{-2} B. 3.50ms^{-2}
 C. 1.00ms^{-2} D. 2.00ms^{-2}
5. A car accelerates uniformly from rest at 4ms^{-2} . How far will it travel in the fifth complete second?
 A. 100m B. 50m C. 32m D. 18m

6. Which of the diagrams below shows the position at which a small ball-bearing is in neutral equilibrium?



7. A body of mass 12kg travelling at 4.2ms^{-1} collides with a second body of mass 18kg at rest. Calculate their common velocity if the two bodies coalesce after collision.
 A. 1.5ms^{-1} B. 1.4ms^{-1} C. 2.1ms^{-1}
 D. 1.7ms^{-1}
8. A bullet fired vertically upward from a gun held 2.0m above the ground reaches its maximum height in 4.0 s. calculate its initial velocity.
 A. 10ms^{-1} B. 8ms^{-1} C. 40ms^{-1}
 D. 20ms^{-1} [g = 10ms^{-2}]
9. **I. The motion of the tyres of a moving car.**
II. The motion of a loaded test tube oscillating vertically.
III. The beating of the heart.
IV. A stone tied to a string and whirled round.
V. The motion of the pistons in a gasoline engine.

Which of the motions above is simple harmonic?

- A. III, IV and V only
 B. II, III and V only
 C. II, III and IV only
 D. I, II and III only
10. If a cage containing a truck of coal weighing 750kg is raised to a height of 90m in 1 minute, what is the total power expended?

- A. 11.50 kW B. 12.60 kW
 C. 11.25 kW D. 12.10 kW
 [g = 10ms⁻²]

11. An object of mass 80kg is pulled on a horizontal rough ground by a force of 500 N. Find the coefficient of static friction.

- A. 0.8 B. 0.4 C. 1.0 D. 0.6
 [g = 10ms⁻²]

12. If a heavy barrel is rolled up a plane inclined at 30° to the horizontal, its velocity ratio will be

- A. 3.0 B. 3.1 C. 3.2 D. 2.0

13. The terminal velocity of a ball-bearing falling through a viscous fluid is reached when the

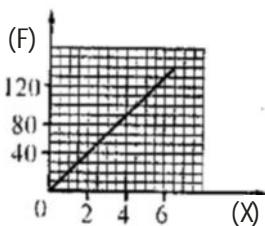
- A. upthrust is equal to the weight of the ball
 B. ball accelerates uniformly
 C. upthrust is equal to the velocity of the ball
 D. velocity is uniform.

14. I. **Density of the liquid**
 II. **Acceleration due to gravity**
 III. **Type of container of the liquid**
 IV. **The constituents of the liquid.**

Which of the above conditions will NOT affect the pressure of fluids?

- A. I and III only B. II and III only
 C. III and IV only D. I and II only

15.



The diagram above represents the graph of the force (F) applied in stretching a spiral spring against the corresponding

extension (X). The force constant of the spring is

- A. 20Nm⁻¹ B. 40Nm⁻¹ C. 30Nm⁻¹
 D. 10Nm⁻¹

16. If a load of mass 10N stretches a cord 1.2cm, what is the total work done?

- A. 6.0 x 10⁻² J B. 7.6 x 10⁻² J
 C. 1.8 x 10⁻² J D. 6.6 x 10⁻² J

17. A plastic sphere floats in water with 50% of its volume submerged. If it floats in glycerine with 40% of its volume submerged, the density of the glycerine is

- A. 1400kgm⁻³ B. 1250kgm⁻³
 C. 500kgm⁻³ D. 1000kgm⁻³

[density of water = 1000kgm⁻³]

18. The thermometer whose reading is indicated by a change in colour of its thermometric property is the

- A. bi-metallic strip thermometer
 B. thermocouple
 C. platinum resistance thermometer
 D. optical pyrometer.

19. At 4°C, the volume of a fixed mass of water is

- A. constant B. minimum
 C. maximum D. zero.

20. The pressure of two moles of an ideal gas at a temperature of 27°C and volume 10⁻²m³ is

- A. 4.99 x 10⁵ Nm⁻² B. 9.80 x 10³ Nm⁻²
 C. 4.98 x 10³ Nm⁻² D. 9.80 x 10⁵ Nm⁻²

[R = 8.313 J mol⁻¹ K⁻¹]

21. An electric heater rated 220V, 1000W is immersed into a bucket full of water. Calculate the mass of water if the temperature changes from 30°C to 100°C and the current flows for 300 seconds.

- A. 4.28kg B. 42.86kg C. 1.02kg
 D. 7.14kg

[Specific heat capacity of water

$$= 4200 \text{ J kg}^{-1} \text{ K}^{-1}]$$

22. If the pressure of the vapour on top of an enclosed liquid is equal to the atmospheric pressure, what will be the temperature of the liquid enclosed?

- A. Room temperature.
- B. Boiling point.
- C. Freezing point.
- D. Standard temperature.

23. A heating coil rated 1000W is used to boil off completely 2kg of boiling water. The time required to boil off the water is

- A. $1.15 \times 10^4 \text{ s}$
- B. $1.15 \times 10^3 \text{ s}$
- C. $4.6 \times 10^4 \text{ s}$
- D. $4.6 \times 10^3 \text{ s}$

[specific latent heat of vaporization of water = $2.3 \times 10^6 \text{ J kg}^{-1}$]

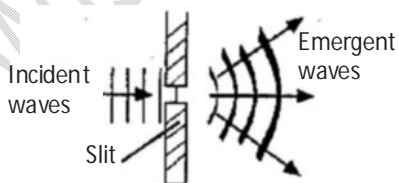
24. It is observed that water will wet a clean glass because the

- A. cohesion of water to glass is stronger than the cohesion of water molecules
- B. adhesion of water molecules is weaker than the cohesion of water to glass
- C. cohesion of water to glass is weaker than the cohesion of water molecules
- D. adhesion of water molecules is stronger than the cohesion of water molecules.

25. A man standing 2m from a charcoal fire is warmed mainly by

- A. convection
- B. radiation
- C. refraction
- D. conduction.

26.



The wave phenomenon demonstrated in the diagram above is

- A. reflection
- B. deflection
- C. diffraction
- D. refraction.

27. A progressive wave is represented by

$$y = 10\sin(1000\pi t - \frac{\pi x}{34}).$$

Two layers of the wave separated by 153cm have a phase difference of

- A. 270°
- B. 45°
- C. 90°
- D. 180°

28. Metal cables are used as telephone wires because

- A. they are cheap
- B. they are sourced locally
- C. the speed of sound in them is very low
- D. the speed of sound in them is very high.

29. Musical instruments playing the same note can be distinguished from one another owing to the differences in their

- A. quality
- B. pitch
- C. intensity
- D. loudness.

30. If a light wave has a wavelength of 500nm in air, what is the frequency of the wave?

- A. $3.0 \times 10^{14} \text{ Hz}$
- B. $6.0 \times 10^{14} \text{ Hz}$
- C. $6.0 \times 10^{12} \text{ Hz}$
- D. $2.5 \times 10^{14} \text{ Hz}$

[$c = 3 \times 10^8 \text{ ms}^{-1}$]

31. I. Moon.

II. Sun.

III. Street light.

IV. Stars.

Which of the above is a natural source of light?

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

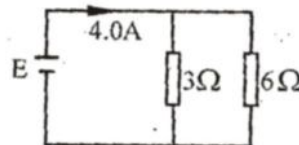
32. An object is placed 5cm from the pole of a concave mirror. If the focal length of the

mirror is 10cm, what is the image distance?

- A. 10cm in front of the mirror.
 B. 5cm in front of the mirror.
 C. 10cm behind the mirror.
 D. 5cm behind the mirror.
33. Calculate the position of an object placed in front of a convex mirror having focal length of 12cm such that an image is formed 6cm away from the mirror.
 A. 4.0cm B. 3.0cm
 C. 12.0cm D. 9.0cm
34. If the refractive index of crown glass is 1.51, its critical angle is
 A. 48.6° B. 22.5°
 C. 41.5° D. 45.0°
35. When light passes through two media x and y of refractive indices 1.51 and 1.33 respectively, the speed of light in
 A. x is same as in y
 B. x and y is same as in vacuum
 C. x is higher than in y
 D. y is higher than in x.
36. A near-sighted student has a near point of 0.1m and a focal length of 5.0cm. What is the student's far point?
 A. 0.200m B. 8.000m
 C. 0.125m D. 2.100m
37. The ability of the human eye to focus objects on the retina is referred to as the power of
 A. interference B. diffraction
 C. accommodation D. superposition
38. Which of the following is a secondary colour?
 A. Blue B. Orange
 C. Red D. Green.
39. If negative charges are induced on an electroscope and a positively charged rod

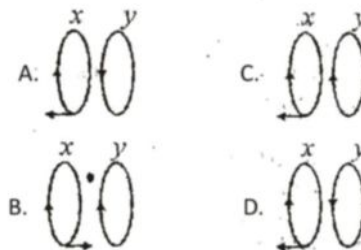
is brought near the cap of the electroscope, the leaves will

- A. close up
 B. become positively charged
 C. become negatively charged
 D. open further.
- 40.

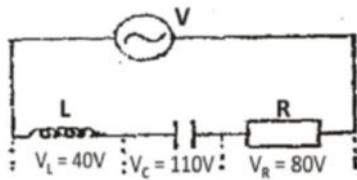


Calculate the e.m.f. of the cell in the above circuit if its internal resistance is negligible.

- A. 12V B. 8V C. 2V D. 36V
41. An electric lamp marked 240V, 60W is left to operate for an hour. How much energy is generated by the filament?
 A. 3.86×10^5 J B. 3.56×10^5 J
 C. 1.80×10^4 J D. 2.16×10^5 J
42. A band of 500 rectangular loops of wire of area 20cm by 20cm, encloses a region of magnetic field which changes from 1.0T to 0.4T within 5 seconds, calculate the induced e.m.f.
 A. 5.60V B. 24.00V C. 0.24V
 D. 2.40V
43. Two coils x and y are arranged co-axially. If coil x carries a clockwise current and is free to move, which of the figures below depicts the direction of the induced current in coil y?



44.



From the diagram above, if the potential difference across the resistor, capacitor and inductor are 80V, 110V and 40V respectively, the effective potential difference is

- A. 116.3V B. 50.0V
C. 230.0V D. 106.3V

45. Cancerous cells can be destroyed by
A. ultraviolet rays B. alpha particles
C. x-rays D. infrared rays.
46. If the decay constant of a radioactive substance is 0.231s^{-1} , the half-life is
A. 3.00s B. 0.12s C. 0.33s
D. 1.50s
47. A piece of radioactive material contains 10^{20} atoms. If the half life of the material is 20 seconds, the number of disintegrations in the first second is
A. 3.47×10^{18} B. 6.93×10^{20}
C. 3.47×10^{20} D. 6.93×10^{18}
48. Thermionic emission is the process whereby
A. β -rays are produced
B. holes are produced
C. x-rays are produced
D. electrons leave a hot element.
49. Which of the following can conduct electricity owing to the presence of the free mobile electrons?
A. Germanium B. Silicon
C. Grapefruit D. Copper
50. When a pentavalent impurity is added to a pure semiconductor, it becomes
A. a p-type semiconductor

- B. an n-type semiconductor
C. an insulator
D. an intrinsic semiconductor.

2009 Answers

1. Option B.
2. Option B.
3. Option C.
4. Option D.
5. Option D.
6. Option A.
7. Option D.
8. Option C.
9. Option B.
10. Option C.
11. Option D.
12. Option D.
13. Option A.
14. Option C.
15. Option A.
16. Option A.
17. Option B.
18. Option D.
19. Option B.
20. Option A.
21. Option C.
22. Option B.
23. Option D.
24. Option D.
25. Option B.
26. Option C.
27. Option B.
28. Option D.
29. Option A.
30. Option B.
31. Option D.
32. Option C.
33. Option C.
34. Option C.
35. Option D.

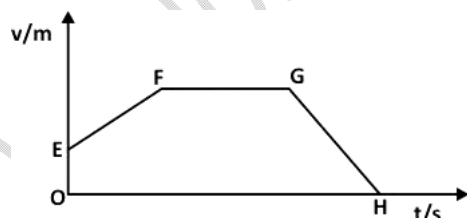
36. Option B.
37. Option C.
38. Option B.
39. Option A.
40. Option B.
41. Option D.
42. Option D.
43. Option C.
44. Option D.
45. Option C.
46. Option A.
47. Option A.
48. Option D.
49. Option D.
50. Option B.

UTME 2010

Questions - Type B

1. Which Physics Question Paper Type is given to you?
 - A. Type A
 - B. Type B
 - C. Type C
 - D. Type D
2. Two cars moving in the same direction have speeds of 100kmh^{-1} and 130kmh^{-1} . What is the velocity of the faster car as measured by an observer in the slower car?
 - A. 130kmh^{-1}
 - B. 230kmh^{-1}
 - C. 200kmh^{-1}
 - D. 30kmh^{-1}

3.



The diagram above shows a velocity-time graph. The statement that is true about this motion is that, the car

- A. decelerates between points F and H

- B. accelerates between points F and G
- C. has a constant speed between points E and F
- D. has no acceleration between point F and G.

4. A stone and a feather dropped from the same height above the earth surface. Ignoring air resistance, which of the following is correct?
 - A. The stone and feather will both reach the ground at the same time.
 - B. The stone will reach the ground first
 - C. The feather will reach the ground first
 - D. The feather will be blown away by the wind while stone will drop steadily.
5. A car moves with an initial velocity of 25ms^{-1} and reaches a velocity of 45ms^{-1} in 10s. What is the acceleration of the car?
 - A. 5ms^{-1}
 - B. 25ms^{-1}
 - C. 20ms^{-1}
 - D. 2ms^{-1}

6. An object is weighed at different locations on the earth. What will be the right observation?
 - A. Both the mass and weight vary
 - B. The weight is constant while the mass varies
 - C. The mass is constant while the weight varies
 - D. Both the mass and weight are constant.

7.



The diagram above represents balls in an undulating surface. Which of the following option represent position of stable equilibrium?

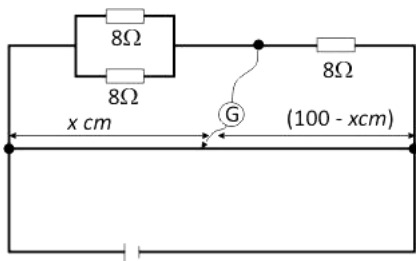
- A. II, V and VIII
- B. I, IV, VII
- C. III, VI and IX
- D. III, IV and VIII

8. A bob of weight 0.1N hangs from a massless string of length 50cm. A variable horizontal force which increases from zero is applied to pull the bob until the string makes an angle of 60° with the vertical. The work done is
 A. 0.250 J B. 0.025J
 C. 0.050 J D. 0.500 J
9. The surfaces of conveyor belts are made rough so as to
 A. prevent the load from slipping
 B. make them stronger
 C. enable them to carry more load
 D. protect them while carrying load.
10. A machine of velocity ratio 6 requires an effort of 400N to raise a load of 800N through 1 m. Find the efficiency of the machine.
 A. 50% B. 22.2%
 C. 33.3% D. 55.6%
11. If a wire 30cm long is extended to 30.5cm by a force of 300N. Find the strain energy of the wire.
 A. 7.50 J B. 750.00 J
 C. 75.00 J D. 0.75 J
12. In a hydraulic press, the pump piston exerts a pressure of 100 Pa on the liquid. What force is exerted in the second piston of cross-sectional area 3m^2 ?
 A. 200 N B. 100 N C. 150 N D. 300 N
13. The accurate measurement of the relative density of a substance in its powdered form is done with a beam balance and
 A. an eureka can B. a burette
 C. a pipette D. a density bottle.
14. A hydrometer is an instrument used in measuring
 A. density of liquid
 B. relative density of a liquid
 C. relative humidity of a liquid
 D. vapour pressure of a fluid
15. One special advantage of alcohol over mercury as a thermometric liquid is its
 A. low freezing point
 B. low boiling point
 C. high specific heat capacity
 D. low density.
16. Two metals P and Q of lengths l_1 and l_2 are heated through the same temperature difference. If the ratio of the linear expansivities of P to Q is 2 : 3 and the ratio of their lengths is 3 : 4. What is the ratio of increase in lengths of P to Q?
 A. 5 : 7 B. 2 : 1
 C. 1 : 2 D. 7 : 5
17. The density of a certain oil on frying becomes 0.4kgm^{-3} with a volume of 20m^3 . What will be its initial volume when its initial density is 0.8kgm^{-3} assuming no loss of oil due to spillage?
 A. 10kgm^{-3} B. 5kgm^{-3}
 C. 8kgm^{-3} D. 12kgm^{-3}
18. Heat is radiated by all hot objects in the form of
 A. light energy B. solar energy
 C. infrared ray D. x-rays.
19. If a container is filled with ice to the brim, what happens to the level of water when the ice completely melts?
 A. The water in the glass outflows.
 B. The level of water drops.
 C. The level of water remains unchanged
 D. The level of water goes up.
20. The small droplet of water that forms on the grass in the early hours of the morning is
 A. dew B. mist C. fog D. hail.
21. A vapour is said to be saturated when

- A. a dynamic equilibrium exists such that more molecules return to the liquid than are leaving it.
- B. the vapour pressure is atmospheric
- C. the temperature of the vapour varies
- D. a dynamic equilibrium exists between liquid molecules and the vapour molecules.
22. The pressure of one mole of an ideal gas of volume 10^{-2}m^3 at a temperature of 27°C is
 A. $2.24 \times 10^4 \text{ Nm}^{-2}$ B. $2.24 \times 10^5 \text{ Nm}^{-1}$
 C. $2.49 \times 10^5 \text{ Nm}^{-1}$ D. $2.49 \times 10^4 \text{ Nm}^{-1}$.
 [Molar gas constant = $8.3 \text{ Jmol}^{-1}\text{K}^{-1}$]
23. Which of the following has no effect on radiation?
 A. density.
 B. temperature.
 C. surface area.
 D. nature of the surface.
24. The wavelength of a wave travelling with a velocity of 420ms^{-1} is 42 m. What is its period?
 A. 1.0s B. 0.1s
 C. 0.5s D. 1.2s
25. The sound of an electric bell dies down slowly when air is slowly pumped out from a bottle because
 A. sound cannot pass through the bottle
 B. sound can pass through a vacuum
 C. sound needs a material medium
 D. the wavelength of sound becomes greater in the bottle.
26. During a thunderstorm, the sound is heard over a long time. This phenomenon is referred to as
 A. refraction of sound
 B. reverberation
 C. superposition
 D. diffraction of sound.
27. The velocity of sound in air at 16°C is 340 ms^{-1} . What will it be when the pressure is doubled and its temperature raised to 127°C ?
 A. $4,000\text{ms}^{-1}$ B. $160,000 \text{ ms}^{-1}$
 C. $8,000 \text{ ms}^{-1}$ D. 400 ms^{-1}
28. In comparing the camera and the human eye, the film of the camera functions as the
 A. iris B. pupil
 C. cornea D. retina
29. An object 4 cm high is placed 15 cm from a concave mirror of focal length 5 cm. The size of the image is
 A. 3 cm B. 5 cm C. 4 cm D. 2 cm
30. An object is embedded in a block of ice, 10cm below the plane surface. If the refractive index of the ice is 1.50, the apparent depth of the object below the surface is
 A. 6.67 cm B. 7.63 cm
 C. 7.50 cm D. 2.50 cm
31. Which of the following is used for the correction of short-sightedness?
 A. Concave lens.
 B. Concave mirror.
 C. Convex mirror.
 D. Convex lens.
32. Dispersion occurs when white light passes through a glass prism because of the
 A. different speeds of the colours in the glass.
 B. high density of the glass.
 C. defects in the glass.
 D. different hidden colours in the glass.
33. When a positively charged rod is brought nearer the cap of a positively charged electroscope, the leaves divergence will.
 A. converge B. remain constant
 C. diverge D. be induced.

34. Three capacitors of capacitance, $2\mu\text{F}$, $4\mu\text{F}$ and $8\mu\text{F}$ are connected in parallel and a p.d of 6V is maintained across each capacitor, the total energy stored is
 A. $6.90 \times 10^{-6} \text{ J}$ B. $6.90 \times 10^{-4} \text{ J}$
 C. $2.52 \times 10^{-4} \text{ J}$ D. $2.52 \times 10^{-6} \text{ J}$
35. A cell of emf 12V and internal resistance 4Ω is connected to an external resistor of resistance 2Ω . Find the current flow.
 A. 4 A B. 2 A C. 3 A D. 5 A

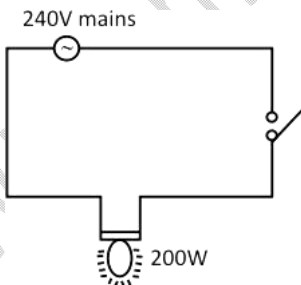
36.



The diagram above shows a balanced metre bridge, the value of x is

- A. 66.7 cm B. 25.0 cm
 C. 33.3 cm D. 75.0 cm .
37. Three 4Ω resistors connected in parallel have a potential difference of 16V applied across them. What is the total current in the circuit?
 A. 12 A B. 8 A C. 10 A D. 14 A

38.

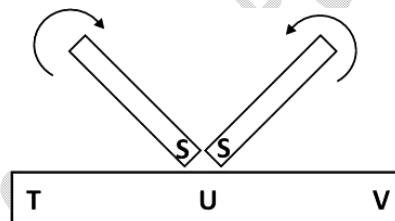


In the diagram above, a 200 W bulb is lighted by a 240 V a.c mains supply. If 1kWh is sold at $\text{N}40$, the cost of keeping the bulb lighted for a day is

- A. $\text{N}192.00$ B. $\text{N}1.92$
 C. $\text{N}19.20$ D. $\text{N}1,920.00$.

39. Power supply is transmitted at a very high voltage and low current in order to
 A. increase the power supply
 B. prevent overheating of the coil
 C. make it travel fast
 D. make it pass through the transformers.

40.

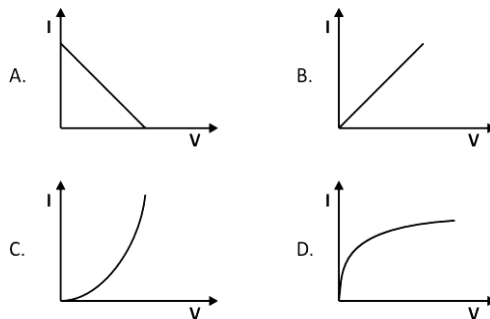


In the diagram above, if the south-poles of two magnets stroke a steel bar, the polarities at T and V will respectively be

- A. north and south B. south and south
 C. north and north D. south and north.
41. A galvanometer with full-scale deflection of 10 mA is to be converted to a voltmeter with full-scale deflection of 5 V . If a series resistance of 498Ω is used for the conversion, the resistance of the galvanometer is
 A. 2Ω B. 10Ω C. 5Ω D. 1Ω
42. Two inductors of inductances 5 mH and 15 mH are connected in series and a current of 5 A flows through them. The total energy stored in the inductors is
 A. 250.0 J B. 50.0 J C. 62.5 J
 D. 500.0 J
43. In alternating current circuit at resonance, the angle of lead or lag is
 A. $\frac{\pi^\circ}{2}$ B. 0° C. $\frac{\pi^\circ}{3}$ D. π°
44. In Faraday's law of electrolysis, a graph of mass deposited against the quantity of

electricity is plotted. The slope of the graph gives

- A. the electrochemical equivalent
 B. the charge released
 C. the current flowing
 D. the energy released
45. In a discharge tube, most of the gas is pumped out so that electricity is conducted at
 A. steady voltage
 B. high pressure
 C. high pressure
 D. low voltage.
46. The radioisotope ${}_{92}^{235}\text{U}$ decays by emitting two alpha particles, three beta particles and a gamma ray. What is the mass and atomic numbers of the resulting daughter element?
 A. 91 and 227 B. 92 and 238
 C. 227 and 91 D. 215 and 88.
47. The ground state energy for a hydrogen atom is 5.44×10^{-19} J. If an electron drops from zero to ground state, calculate the frequency of the emitted radiation
 A. 2.0×10^{16} Hz B. 2.0×10^{15} Hz
 C. 5.0×10^{15} Hz D. 5.0×10^{16} Hz
 [$h = 6.6 \times 10^{-34}$ Js]
48. Transistors are used for the
 A. conversion of a.c. to d.c. B. conversion of d.c. to a.c.
 C. amplification of signals
 D. rectification of signals.
49. A typical transistor characteristic is represented as



50. Which of the following is a pure semiconductor?
 A. Silicon B. Phosphorus
 C. Transistor D. Carbon.

2010 Answers - Type B

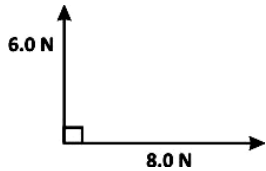
1. The Question Type is B.
2. Option D.
3. Option D.
4. Option A.
5. Option D.
6. Option C.
7. Option C.
8. Option B.
9. Option A
10. Option C.
11. Option D.
12. Option D.
13. Option A.
14. Option B.
15. Option A.
16. Option C.
17. Option A.
18. Option C.
Infrared rays are called heat rays.
19. Option B.
Water expands on solidification; when this solid melts, it implies the water reduces in volume.

-
20. Option A.
 21. Option D.
 22. Option C.
 23. Option A.
 24. Option B.
 25. Option C.
 26. Option B.
 27. Option D.
 28. Option D.
 29. Option D.
 30. Option A.
 31. Option A.
 32. Option A.
 33. Option C.
 34. Option C.
 35. Option B.
 36. Option C.
 37. Option A.
 38. Option A.
 39. Option B.
 40. Option C.
 41. Option A
 42. Option B
 43. Option B
 44. Option A.
 45. Option B.
 46. Option C.
 47. Option B.
 48. Option C.
 49. Option D.
 50. Option A.

UTME 2011 Questions (TYPE B)

1. Which Question Paper Type of Physics is given to you?
A. Type A B. Type B
C. Type C D. Type D.
2. A carpenter on top of a roof 20.m high dropped a hammer of mass 1.5kg and it fell freely to the ground. The kinetic energy of the hammer just before hitting the ground is
A. 450 J B. 600 J
C. 150 J D. 300 J
[$g = 10\text{ms}^{-2}$]
3. Two balls X and Y weighing 5g and 50kg respectively were thrown up vertically at the same time with a velocity of 100ms^{-1} . How will their positions be one second later?
A. X and Y will both be 500m from the point of throw
B. X and Y will be 500m from each other
C. Y will be 500 m ahead of X
D. X will be 500m ahead of Y.
4. A man standing on a lift that is descending does not feel any weight because
A. there is no gravitational pull on the man in the lift
B. the inside of the lift is air tight
C. the lift is in vacuum
D. there is no reaction from the floor of the lift.

5.



The diagram above shows two vectors at right angles to each other. The value of the resultant vector is

- A. 13.0 N B. 14.0 N
C. 10.0 N D. 12.0 N.

6. An object of mass 2kg moves with a velocity of 10ms^{-1} round a circle of radius 4m. calculate the centripetal force on the object.

- A. 40 N B. 25 N
C. 100 N D. 50 N

7. If it takes an object 3s to fall freely to the ground from a certain height, what is the distance covered by the object?

- A. 60 m B. 90 m
C. 30 m D. 45 m.

$$[g = 10\text{ms}^{-2}]$$

8.



The diagrams above show the positions of a cone. The position which can be described as neutral equilibrium is represented as

- A. Y and X B. Z only
C. X only D. Y and Z.

9. If a tube of small radius opened at both ends is placed in a liquid, the liquid will

- A. rise above the liquid level if the liquid does not wet the glass
B. remain at the same level irrespective of whether the liquid wets the glass or not
C. fall below the liquid level if the liquid wets the glass
D. fall below the liquid level if the liquid does not wet the glass.

10. I. **Density of the liquid**

II. **Depth below the surface of the liquid.**

III. **Surface area of the liquid**

In which of the statement above will pressure be dependent?

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

11. I. **High thermal capacity**

II. **High sensitivity**

III. **Easy readability**

IV. **Accuracy over a wide range of temperatures**

From the statements above, the qualities of a good thermometer are

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

12. A machine is used to lift a load of 20 N through a height of 10m. if the efficiency of the machine is 40%, how much work is done?

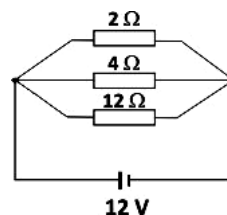
- A. 120 J B. 80 J
C. 500 J D. 300 J.

13. Which of the following could be effectively used to reduce friction?

- A. Petrol B. Kerosene
C. Grease D. Water.

14. A copper wire was subjected to a tensile stress of $7.7 \times 10^7 \text{ Nm}^{-2}$. Calculate the tensile strain of the wire
 A. 2.2×10^{-4} B. 2.0×10^{-5}
 C. 7.0×10^{-3} D. 7.0×10^{-4}
 [Young modulus = $1.1 \times 10^{11} \text{ Nm}^{-2}$]
15. An object weighs 22kg in water and 30kg in air. What is the upthrust exerted by the liquid on the object?
 A. 80 N B. 50 N
 C. 520 N D. 220 N.
 [g = 10 ms^{-2}]
16. A block of aluminium is heated electrically by a 30 W heater. If the temperature rises by 10°C in 5 minutes, the heat capacity of the aluminium is
 A. 200 JK^{-1} B. 900 JK^{-1}
 C. 90 JK^{-1} D. 100 JK^{-1}
17. A perfect emitter or absorber of radiant energy is a
 A. red body B. conductor
 C. black body D. white body.
18. The phenomenon that shows that increase in pressure lowers the melting point can be observed in
 A. regelation B. sublimation
 C. condensation D. coagulation.
19. If the volume of a gas increases steadily as the temperature decreases at constant pressure, the gas obeys
 A. Charles' law
 B. Graham's law
 C. Boyle's law
 D. pressure law.
20. Steam burn is more severe than that of boiling water because
 A. steam burn is dependent on relative humidity
 B. steam burn is independent of relative humidity
 C. steam possess greater heat energy per unit mass
 D. water boils at a higher temperature
21. Which of the following types of waves needs a medium for propagation?
 A. X-rays B. Sound waves
 C. Light waves D. Radio waves.
22. The ground is always cold at night because the
 A. atmosphere reflects the sun's energy at night
 B. atmosphere absorbs the sun's energy at night
 C. earth radiates heat to the atmosphere at night
 D. sun no longer shines at night.
23. A metal of volume 40cm^3 is heated from 30°C to 90°C , the increase in volume is
 A. 0.40cm^3 B. 0.14cm^3
 C. 4.00cm^3 D. 1.20cm^3 .
 [Linear expansivity of the metal = $2.0 \times 10^{-5} \text{ K}^{-1}$]
24. **I. Change of state**
II. Diffusion
III. Radiation
IV. Osmosis
 Which of the processes above can be explained using the kinetic theory?
 A. I, II and IV B. I, II, III and IV
 C. I, II and III D. I, III and IV.

25. When the human eye loses its power of accommodation, the defect is known as
- long-sightedness
 - short-sightedness
 - presbyopia
 - astigmatism.
26. A length of wire has a frequency of 255 Hz when stretched by a force of 225 N. If the force increases to 324 N, what is the new frequency of vibration?
- 356 Hz
 - 306 Hz
 - 512 Hz
 - 488 Hz.
27. A certain far-sighted person cannot see objects that are closer to the eye than 50 cm clearly. Determine the power of the converging lens which will enable him to see at 25 cm.
- 0.04 D
 - 0.06 D
 - 0.02 D
 - 0.03 D.
28. Which of the following electromagnetic waves has the highest frequency?
- X-rays
 - Ultra-violet rays
 - Radio waves
 - Infrared-rays.
29. When a red rose flower is observed in blue light, what colour does the observer see?
- Yellow
 - Red
 - Blue
 - Magenta.
30. The eclipse of the sun occurs when the
- moon's umbra falls on some part of the earth
 - moon is between the sun and the earth
 - earth is between the sun and the moon
 - moon is not completely hidden in the earth's shadow.
31. A cannon is fired from town X. After how long is the sound heard at a town Y 4.95 km away?
- 15 s
 - 30 s
 - 10 s
 - 12 s
- [velocity of sound in air = 333 ms^{-1}]
32. An image in a convex lens is upright magnified 3 times. If the focal length of the lens is 15 cm, what is the object distance?
- 14 cm
 - 10 cm
 - 25 cm
 - 26 cm.
33. The capacitance of a parallel plate capacitor is $20 \mu\text{F}$ in air and $60 \mu\text{F}$ in the presence of a dielectric. What is the dielectric constant?
- 2.0
 - 0.3
 - 6.0
 - 3.0.
- 34.



In the circuit above, three resistors, 2Ω , 4Ω and 12Ω are connected in parallel and a 12 V battery is connected across the combination. The current flowing through the 12Ω resistor is

- 9.6 A
- 14.4 A
- 1.0 A
- 3.2 A.

35. If the charge of electricity per kWh is N4, what is the cost of operating an electrical appliance rated 2.50 V, 2 A for 6 hours?
 A. N24 B. N0.12
 C. N12 D. N16.
36. The correct expression for the potential at a point, distance r from a charge q , in an electric field is
 A. $\frac{q}{4\pi \epsilon_0 r}$ B. $\frac{q^2}{4\pi \epsilon_0 r^2}$
 C. $\frac{q^2}{4\pi \epsilon_0 r}$ D. $\frac{q}{4\pi \epsilon_0 r^2}$
37. Three similar cells each of e.m.f 2V and internal resistance 2Ω are connected in parallel, the total e.m.f and total internal resistance are respectively
 A. 6 V, 0.7Ω B. 6 V, 6.0Ω
 C. 2 V, 0.7Ω D. 2 V, 6.0Ω .
38. In homes, electrical appliances and lamps are connected in parallel because
 A. less voltage will be used
 B. parallel connection does not heat up the wires
 C. series connection uses high voltage
 D. less current will be used.
39. Two resistors 5Ω and 10Ω are arranged first in series and later in parallel to a 24 V source. The ratio of total power dissipated in the series and parallel arrangement respectively is
 A. 3:5 B. 5:3
 C. 1:50 D. 50:1.
40. Which of the following will be applied when a metal x in electrolysis?
 A. Y is the anode and very high current is used
 B. X is the anode and very high current is used
 C. X is the cathode and Y is the anode
 D. Y is the cathode and X is the anode
41. A radioactive isotope has a decay constant of 10^{-5}s^{-1} . Calculate its half life.
 A. $6.93 \times 10^{-6} \text{s}$ B. $6.93 \times 10^{-5} \text{s}$
 C. $6.93 \times 10^5 \text{s}$ D. $6.93 \times 10^4 \text{s}$
42. Which of the following is a property of steel?
 A. It can easily be magnetized and demagnetized
 B. It cannot retain its magnetism longer than iron
 C. It can be used for making temporary magnets
 D. It can be used for making permanent magnets.
43. If the threshold frequency for tungsten is $1.3 \times 10^{15} \text{Hz}$, what is its work function?
 A. $8.85 \times 10^{-18} \text{J}$ B. $8.58 \times 10^{-19} \text{J}$
 C. $8.58 \times 10^{-15} \text{J}$ D. $8.58 \times 10^{-17} \text{J}$
 [h = $6.6 \times 10^{-34} \text{Js}$]
44. In an a.c. circuit, the ratio of r.m.s value to peak value of current is
 A. $\sqrt{2}$ B. 2

C. $\frac{1}{2}$

D. $\frac{1}{\sqrt{2}}$

45. Two inductors of inductances 4H and 8H are arranged in series and a current of 10A is passed through them. What is the energy stored in them?

A. 250 J

B. 500 J

C. 50 J

D. 133 J.

46. Under which of the following conditions do gases conduct electricity?

A. High pressure and high p.d

B. Low pressure and low p.d

C. low pressure and high p.d

D. High pressure and low p.d

47. In measuring high frequency a.c., the instrument used is the

A. hot wire ammeter

B. d.c. ammeter

C. moving coil ammeter

D. moving iron ammeter.

48. The bond between silicon and germanium is

A. electrovalent B. covalent

C. ionic D. dative.

49. Which of the following materials has an increase in resistance with temperature

A. Electrolyte B. Water

C. Metals D. Wood.

50. The electrical properties of germination can be altered drastically by the addition of impurities. The process is referred to as

A. doping B. saturation

C. bonding D. amplification.

UTME Physics 2011

Type: B

1. Type B
2. Option D
3. Option C
4. Option D
5. Option C
6. Option D
7. Option D
8. Option B
9. Option B
10. Option B
11. Option A
12. Option C
13. Option C
14. Option D
15. Option A
16. Option B
17. Option C
18. Option A
19. Option
20. Option C
21. Option B
22. Option C
23. Option B
24. Option A
25. Option C
26. Option B
27. Option A
28. Option A
29. Option D
30. Option B
31. Option B
32. Option B
33. Option
34. Option C
35. Option B

- 36. Option A
- 37. Option C
- 38. Option C
- 39. Option C
- 40. Option D
- 41. Option D
- 42. Option D
- 43. Option B
- 44. Option D
- 45. Option D
- 46. Option C
- 47. Option A
- 48. Option B
- 49. Option D
- 50. Option A

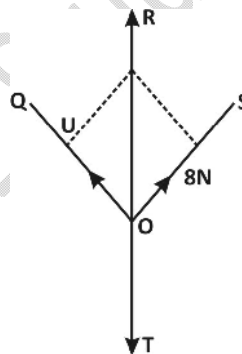
UTME 2012 Physics
Questions – Type Yellow

1. Which Question paper type of physics as indicated above is given to you
 - A. Type Green
 - B. Type Purple
 - C. Type Red
 - D. Type Yellow
2. In order to remove the error of parallax when taking measurements with a metre rule, the eye should be focused
 - A. slantingly towards the left on the markings
 - B. slantingly towards the right on the markings
 - C. vertically downwards on the markings

D. vertically upwards on the markings.

3. A load is pulled at a uniform speed along horizontal floor by a rope at 45° to floor. If the force in the rope is 1500N, what is the frictional force on the load?
 - A. 1524N
 - B. 1350N
 - C. 1260N
 - D. 1061N

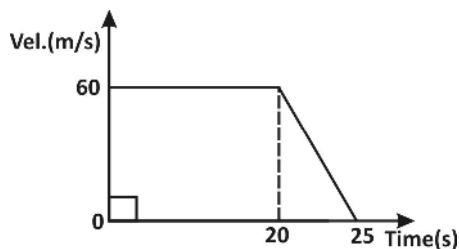
4.



From the diagram above, OT is,

- A. 18N
- B. 14N
- C. 5N
- D. 2N

5.



From the velocity-time graph shown above, which of the following quantities CANNOT be determined?

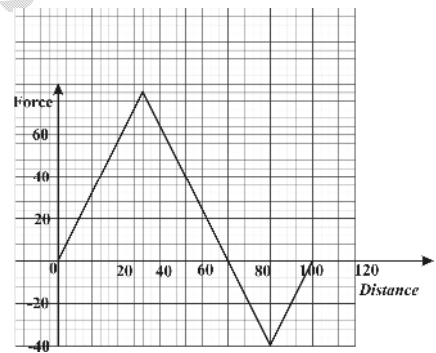
- A. Deceleration.

- B. Initial velocity.
 C. Total distance travelled.
 D. Initial acceleration.
6. Calculate the total distance covered by a train before coming to rest if its initial speed is 30ms^{-1} with a constant retardation of 0.1ms^{-2} .
- A. 5500m
 B. 4500m
 C. 4200m
 D. 3000m.
7. A car starts from rest and moves with a uniform acceleration of 30ms^{-1} for 20s. Calculate the distance covered at the end of the motion.
- A. 6km
 B. 12km
 C. 18km
 D. 24km.
8. A rocket is fired from the earth's surface to a distant planet. By Newton's law of universal gravitation, the force F will
- A. increase as r reduces
 B. increase as G varies
 C. remains constant
 D. increases as r increases.
9. If a freely suspended object is pulled to one side and released, it oscillates about the point of suspension because the
- A. acceleration is directly proportional to the displacement

- B. motion is directed away from the equilibrium point
 C. acceleration is directly proportional to the square of the displacement
 D. velocity is minimum at the equilibrium point.

10. An object moves in a circular path of radius 0.5m with a speed of 1ms^{-1} . What is its angular velocity?
- A. 8rads^{-1}
 B. 4rads^{-1}
 C. 2rads^{-1}
 D. 1rads^{-1}

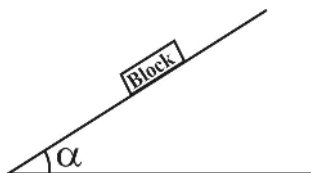
11.



From the diagram above, calculate the work done when the particle moves from $x = 0\text{m}$ to $x = 80\text{m}$.

- A. 1200J
 B. 2400J
 C. 6000J
 D. 7000J

12.



The diagram above shows a wooden block just about to slide down an inclined plane whose inclination to the horizontal is α . The coefficient of frictional force between the block and the plane is

- A. $\sin \alpha$
 - B. $\tan \alpha$
 - C. $\cot \alpha$
 - D. $\cos \alpha$
13. An object of mass 20kg slides down an inclined plane at an angle of 30° to the horizontal. The coefficient of static friction is
- A. 0.2
 - B. 0.3
 - C. 0.5
 - D. 0.6

[$g = 10\text{ms}^{-2}$]

14. A block and tackle is used to raise a load of 25N through a vertical distance of 30m. What is the efficiency of the system if the work done against friction is 1500J?
- A. 62.5%
 - B. 73.3%
 - C. 83.3%
 - D. 94.3%

15. If a load of 1kg stretches a cord by 1.2cm, what is the force constant of the cord?

- A. 866 Nm^{-1}
- B. 833 Nm^{-1}
- C. 769 Nm^{-1}
- D. 667 Nm^{-1}

16. An object of volume 1m^3 and mass 2kg is totally immersed in a liquid of density 1 kgm^{-3} . Calculate its apparent weight.

- A. 20 N
- B. 10 N
- C. 2 N
- D. 1 N

[$g = 10\text{ms}^{-2}$]

17. The pressure at any point in a liquid at rest depends only on the

- A. depth and the density
- B. mass and the volume
- C. quantity and the surface area
- D. surface area and the viscosity.

18. A balloon whose volume is 300m^3 is filled with hydrogen. If the density of air is 1.3kgm^{-3} , find the upthrust on the balloon.

- A. 3000N
- B. 3800N
- C. 3900N
- D. 4200N

[$g = 10\text{ms}^{-2}$]

19. Clinical thermometers are examples of

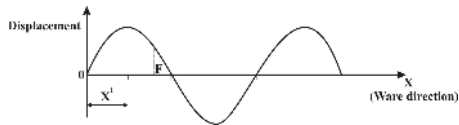
- A. pressure gas thermometer
- B. resistance thermometer

- C. alcohol thermometer
D. mercury-in-glass thermometer.
20. Two metals P and Q are heated through the same temperature difference. If the ratio of the linear expansivities of P to Q is 2: 3 and the ratio of their lengths is 3:4 respectively, the ratio of the increase in lengths of P to Q is
- A. 1 : 2
B. 2 : 1
C. 8 : 9
D. 9 : 8
21. 2000cm^3 of a gas is collected at 27°C and 700mmHg . What is the volume of the gas at standard temperature and pressure?
- A. 1896.5cm^3
B. 1767.3cm^3
C. 1676.3cm^3
D. 1456.5cm^3
22. Calculate the temperature change when 500J of heat is supplied to 100g of water.
- A. 12.1°C
B. 2.1°C
C. 1.2°C
D. 0.1°C
- (Specific heat capacity of water = $4200\text{Jkg}^{-1}\text{K}^{-1}$)
23. Which of the following is NOT a factor that can increase the rate of evaporation of water in a lake?
- A. Increase in the pressure of the atmosphere
B. Rise in temperature
C. Increase in the average speed of the molecules of water
D. Increase in the kinetic energy of the molecules of water.
24. The quantity of heat energy required to melt completely 1kg of ice at -30°C is
- A. $4.13 \times 10^6\text{J}$
B. $4.13 \times 10^5\text{J}$
C. $3.56 \times 10^4\text{J}$
D. $3.56 \times 10^2\text{J}$
- (latent heat of fusion = $3.5 \times 10^5\text{Jkg}^{-1}$, specific heat capacity of ice = $2.1 \times 10^3\text{Jkg}^{-1}\text{K}^{-1}$)
25. I. **It is a rapid, constant and irregular motion of tiny particles.**
II. **It gives evidence that tiny particles of matter called molecules exist.**
III. **It takes place only in gases.**
IV. **It gives evidence that molecules are in a constant state of random motion.**
- Which of the combinations above is correct about Brownian motion?
- A. I, II and III
B. II, III and IV only
C. I, III and IV only
D. I, II and IV only
26. The equation of a wave travelling in a horizontal direction is expressed as

$y = 15 \sin(60t - x)$ what is its wavelength?

- A. 60m
- B. 15m
- C. 5m
- D. 2m

27.



From the diagram above, if the particles F is at a distance x from O to the right, the phase of the vibration will be different from that at O by

- A. 2

28. Which of the following factors will affect the velocity of sound?

- A. An increase in the pitch of the sound
- B. An increase in the loudness of the sound
- C. Wind travelling in the same direction of the sound
- D. A change in the atmospheric pressure at constant temperature.

29. The characteristics of a vibration that determines its intensity is the

- A. Frequency
- B. Overtone
- C. Wavelength
- D. Amplitude

30. Where can a man place his face to get an enlarged image when using a concave mirror to shave?

- A. Between the centre of curvature and the principal focus
- B. At the principal focus
- C. Between the principal and the pole
- D. At the centre of curvature

31. A pinhole camera is placed 300m in front of a building so that the image is formed on a screen 5cm from the pinhole. If the image is 2.5cm high, the height of the building will be

- A. 25m
- B. 50m
- C. 100
- D. 150m

32. The magnification of an object 2cm tall when placed 10cm in front of a plane mirror is

- A. 6.0
- B. 1.0
- C. 0.7
- D. 0.6

33. After reflection from the concave mirror, rays of light from the sun converges

- A. At the radius of curvature
- B. At the focus
- C. Beyond the radius of curvature
- D. Between the focus and radius of curvature

34. A glass block of thickness 10cm is placed on an object. If an observer views the object vertically, the displacement of the object is

- A. 3.33cm

- B. 5.00cm
C. 6.67cm
D. 8.50cm
35. **I. Rays of light travel from a less dense medium to a denser medium**
II. The angle of incidence is greater than critical angle.
III. Rays of light travel from a denser medium to a less dense medium
Which of the statements above are conditions for total internal reflection to occur?
- A. **I & II** only
B. **I & III** only
C. **II & III** only
D. **II** only
36. The use of lenses is **NOT** applicable in the
- A. projector
B. human eye
C. periscope
D. telescope
37. Dispersion of white light is the ability of white light to
- A. Penetrate air, water and glass
B. Move in a straight line
C. Move around corners
D. Separate to its component colours
38. A newly charged 12V accumulator can easily start a car whereas eight new dry cells in series with an effective e.m.f. of 12V cannot start the same car because
- A. The current capacity is high
B. The current capacity is low
C. It cannot be re-charged
D. It cannot easily be connected to a car
39. Six identical cells, each of e.m.f. 2V are connected as shown above. The effective e.m.f. of the cell is
- A. 0V
B. 4V
C. 6V
D. 12V
40. The fuse in an electric device is always connected to the
- A. Neutral side of an electric supply
B. Earth side of an electric supply
C. Live side of an electric supply
D. Terminal side of an electric supply
41. A particle carrying a charge of $1.0 \times 10^{-8}\text{C}$ enters a magnetic field at $3.0 \times 10^2 \text{ms}^{-1}$ at right angles to the field. If the force on this particle is $1.8 \times 10^{-8}\text{N}$, what is the magnitude of the field?
- A. $6.0 \times 10^{-1}\text{T}$
B. $6.0 \times 10^{-2}\text{T}$
C. $6.0 \times 10^{-3}\text{T}$
D. $6.0 \times 10^{-4}\text{T}$
42. Which of the following is the correct shape of the graph of capacity reactance X_c versus frequency F for a pure capacitor in an a.c. circuit?
43. The current output form of an a.c. source is given as $I = 10 \sin \omega t$. The d.c. equivalent of the current is
- A. 5.0A

- B. 7.1A
C. 10.0A
D. 14.1A
44. A conductor of length 1m moves with a velocity of 50ms^{-1} at an angle of 30° to the direction of a uniform magnetic field of flux density 1.5Wbm^{-2} . What is the e.m.f. induced in the conductor?
A. 37.5V
B. 50.5V
C. 75.0V
D. 80.5V
45. The process of detecting a pin mistakenly swallowed by a child x – ray
A. Diagnosis
B. Therapy
C. Crystallography
D. mammography
46. Which of the following particles CANNOT be deflected by both electric and magnetic fields?
A. Gamma rays
B. Alpha particles
C. Wave particles
D. Beta particles
47. A piece of radioactive material contains 1000 atoms. If its half-life is 20 seconds, the time taken for 125 atoms to remain is
A. 20 seconds
B. 40 seconds
C. 60 seconds
D. 80 seconds
48. The p-n junction diodes can act as rectifiers because they
A. Conduct current when forward-biased
B. Conduct current when reverse-biased
C. Block current when forward-biased
D. Conduct current in both directions
49. If a reverse-biased voltage is applied across a p-n junction, the depletion layer width is
A. Increased
B. Decreased
C. Constant
D. halved
50. **I Small size**
II Low power requirement
III Not easily damaged by high Temperature
IV Highly durable
- Which of the above are the advantages of semiconductors?
A. **I, II and III** only
B. **II, III and IV** only
C. **I, II and IV** only
D. **I, II III and IV**

UTME Physics 2012

Type: Yellow

1. Option D.
2. Option C
3. Option D
4. Option B
5. Option D
6. Option B
7. Option A
8. Option A
9. Option A
10. Option C
11. Option B
12. Option B
13. Option D
14. Option C
15. Option B
16. Option B
17. Option A.
18. Option C
19. Option D
20. Option A
21. Option C
22. Option C
23. Option A
24. Option B
25. Option D
26. Option C
27. Option A
28. Option C
29. Option A
30. Option C
31. Option D
32. Option B
33. Option B
34. Option A

35. Option C
36. Option C
37. Option D
38. Option D
39. Option A
40. Option C
41. Option C
42. Option D
43. Option B
44. Option A
45. Option A
46. Option A
47. Option C
48. Option A
49. Option A
50. Option C

2013 UTME Physics – Type U

Questions

1. Which Questions Paper Type of Physics is given to you?
 - A. Type D
 - B. Type I
 - C. Type B
 - D. Type U
2. When a brick is taken from the earth's surface to the moon, its mass
 - A. Becomes zero
 - B. Remains constant
 - C. Reduces
 - D. increases
3. The resultant of two forces is 50N. If the forces are perpendicular to each other and one of them makes an angle of 30° with the resultant, find its magnitude
 - A. 25.0N
 - B. 100.0N
 - C. 57.7N

- D. 57.7N
E. 43.3N
4. The pair of physical quantities that are scalar only are
A. Impulse and time
B. Volume and area
C. Moment and momentum
D. Length and displacement
5. A simple pendulum of length 0.4m has a period 2s. What is the period of a similar pendulum of length 0.8m at the same place?
A. $\sqrt{2}s$
B. 8s
C. 4s
D. $2\sqrt{2}s$
6. A train with an initial velocity of 20ms^{-1} is subjected to a uniform deceleration of 2ms^{-2} . The time required to bring the train to a complete halt is
A. 40s
B. 5s
C. 10s
D. 20s
7. Calculate the apparent weight loss of a man weighing 70kg in an elevator moving downwards with an acceleration of 1.5ms^{-2} .
A. 105N
B. 686N
C. 595N
D. 581N
8. A piece of cork floats in a liquid. What fraction its volume will be immersed in the liquid?
A. 0.1
B. 0.8
C. 0.5
D. 0.2
[density of the cork = $0.25 \times 10^3\text{kgm}^{-3}$
- Density of the liquid = $1.25 \times 10^3\text{kgm}^{-3}$]
9. An object is moving with a velocity of 5ms^{-1} . At what height must a similar body be situated to have a potential energy equal in value with the kinetic energy of the moving body?
A. 1.0m
B. 25.0m
C. 20.0m
D. 1.3m
[$g \approx 10\text{ms}^{-2}$]
10. If a pump is capable of lifting 5000 kg of water through a vertical height of 60 m in 15 min, the power of the pump is
A. $3.3 \times 10^2\text{Js}^{-1}$
B. $2.5 \times 10^5\text{Js}^{-1}$
C. $2.5 \times 10^4\text{Js}^{-1}$
D. $3.3 \times 10^3\text{Js}^{-1}$
11. The coefficient of friction between two perfectly smooth surface is
A. Zero
B. Infinity
C. One
D. Half
12. What effort will a machine of efficiency 90% apply to lift a load of 180N if its efforts arm is twice as long as its load arm?
13. Calculate the work done, when a force of 20N stretches a spring by 50mm.
A. 2.5 J
B. 0.5 J
C. 1.5 J
D. 2.0 J
14. At what depth below the sea-level would one experience a change of pressure equal to one atmosphere?
A. 100.0 m
B. 0.1 m

- C. 1.0 m
D. 10.0 m
15. What volume of alcohol will have the same mass as 4.2m^3 of petrol?
A. 4.9m^3
B. 0.8m^3
C. 1.4m^3
D. 3.6m^3
- [Density of alcohol = $8.4 \times 10^2\text{kgm}^{-3}$
Density of petrol = $7.2 \times 10^2\text{kgm}^{-3}$]
16. Calculate the length which corresponds to a temperature of 20°C if the ice and steam points of an ungraduated thermometer are 400 mm apart
A. 80mm
B. 20mm
C. 30mm
D. 60mm
17. A wire of length 100.0m at 30°C has a linear expansivity of $2 \times 10^{-5}\text{K}^{-1}$. Calculate the length of the wire at a temperature of -10°C
A. 99.92m
B. 100.08m
C. 100.04m
D. 99.96m
18. A gas at a pressure of 10^5Nm^{-2} expands from 0.6m^3 to 1.2m^3 at constant temperature, the work done is
A. $6.0 \times 10^4\text{J}$
B. $7.0 \times 10^7\text{J}$
C. $6.0 \times 10^6\text{J}$
D. $6.0 \times 10^5\text{J}$
19. Two liquids X and Y having the same mass are supplied with the same quantity of heat. If the temperature rise in X is twice that of Y, the ratio of specific heat capacity of X to that of Y is
A. 1 : 4
B. 2 : 1
C. 1 : 2
D. 4 : 1
20. Foods cook quicker in salt water than in pure water because of the effect of
A. Salt on thermal the conductivity of water
B. Dissolved substances on the boiling point
C. Atmosphere pressure on the boiling point
D. Food nutrients on the thermal energy
21. Steam from boiling water cause more damage on the skin does boiling water because
A. Steam brings heat more easily by convection.
B. Water has a high specific heat
C. Steam has latent heat of fusion
D. The steam is at a higher temperature than the water
22. What will happen to the boiling point of pure water when it is heated in a place 30m below the sea level?
A. It will be fluctuating
B. It will be more than 100°C
C. It will be less than 100°C
D. It will still be at 100°C
23. The rise or fall of a liquid in a narrow tube is because of the
A. osmotic pressure of the liquid
B. viscosity of the liquid
C. surface tension of the liquid
D. friction between the walls of the tube and the liquid
24. The mechanism of heat transfer from one point to another through the vibration of the molecules of the medium is
A. diffusion
B. convection
C. conduction

- D. radiation
25. A wave that travels through stretched strings is known as
- seismic wave
 - electromagnetic wave
 - micro wave
 - mechanical wave
26. A transverse wave and a longitudinal wave travelling in the same direction in a medium differ essentially in their
- period of vibration of the particles of the medium
 - frequency
 - amplitude
 - direction of vibration of the particles of the medium
27. What is the velocity of sound at 100°C if the velocity of sound at 0°C is 340ms^{-1}
- 240ms^{-1}
 - 497ms^{-1}
 - 440ms^{-1}
 - 397ms^{-1}
28. If a sonometer has a fundamental frequency of 450Hz , what is the frequency of the fifth overtone?
- 75Hz
 - 2700Hz
 - 456Hz
 - 444Hz
29. A man 1.5m tall is standing 3m in front of a pinhole camera whose distance between the hole and the screen is 0.1m . What is the height of the image of the man on the screen?
- 1.00m
 - 0.05m
 - 0.15m
 - 0.30m
30. A ray of light passing through the centre of curvature of a concave mirror is reflected by the mirror at
- 180°
 - 0°
 - 45°
 - 90°
31. Incident ray
- From the diagram above, calculate the incident angle i
- 61°
 - 41°
 - 49°
 - 55°
32. Total internal reflection will not occur when light travels from
- glass into water
 - water to air
 - water into glass
 - glass to air
- 33.
- What does the diagram above represent?
- Microscope in abnormal use
 - Telescope in normal use
 - Microscope in normal use
 - Telescope in abnormal use
34. If the linear magnification of the objective and eyepiece are 4 and 7 respectively, calculate the angular magnification of the microscope
- 28

- B. 2
C. 3
D. 11
35. The angle of deviation of light of various colours passing through a triangular prism increases in the order
A. blue \rightarrow green \rightarrow red
B. red \rightarrow green \rightarrow blue
C. green \rightarrow violet \rightarrow blue
D. blue \rightarrow red \rightarrow green
36. Calculate the force acting on an electron of charge $1.5 \times 10^{-19}\text{C}$ placed in an electric field of intensity 10^5Vm^{-1} .
A. $1.5 \times 10^{-14}\text{N}$
B. $1.5 \times 10^{-11}\text{N}$
C. $1.5 \times 10^{-12}\text{N}$
D. $1.5 \times 10^{-13}\text{N}$
37. Capacitors are used in the induction coil to
A. prevent distortion of electric fields
B. control circuits
C. dissipate energy
D. prevent electric sparks.
38. A cell of emf 1.5V is connected in series with a 1Ω resistor and a current of 0.3A flows through the resistor. Find the internal resistance of the cell.
A. 1.0Ω
B. 4.0Ω
C. 3.0Ω
D. 1.5Ω
39. Which of the following obeys ohms law?
A. Glass
B. Electrolytes
C. Metals
D. Diode
40. A house has ten 40W and five 100W bulbs. How much will it cost the owner of the house to keep them lit for 10 hours if the cost of a unit is $\text{N}5$?
A. $\text{N}20$
B. $\text{N}90$
C. $\text{N}50$
D. $\text{N}45$
41. An electric device is rated 2000W , 250V . Calculate the maximum current it can take.
A. 6A
B. 9A
C. 9A
D. 7A
42. When a charge moves through an electronic circuit in the direction of an electric force, it
A. loses both potential and kinetic energy
B. gains both potential and kinetic energy
C. gains potential energy and loses kinetic energy
D. loses potential energy and gains kinetic energy
43. To convert a galvanometer to a voltmeter, a
A. low resistance is connected to it in parallel
B. high resistance is connected to it in series
C. high resistance is connected to it in parallel
D. low resistance is connected to it in series
44. Induced emfs are best explained using
A. Lenz's law
B. Ohm's law
C. Faraday's law
D. Coulomb's law
45. If a current of 2.5A flows through an electrolyte for 3 hours and 1.8g of a substance is deposited, what is the mass

of the substance that will be deposited if a current of 4A flows through it for 4.8 hours?

- A. 4.8g
 - B. 2.4g
 - C. 3.2g
 - D. 4.2g
 - E. 4.6g
46. Calculate the energy of the third level of an atom if the ground state energy is -24.8eV
- A. -1.75eV
 - B. -9.20eV
 - C. -8.20eV
 - D. -2.75eV
47. In photo-emission, the number of photoelectrons ejected per second depends on the
- A. Intensity of the beam
 - B. Frequency of the beam
 - C. Work function of the metal
 - D. Threshold frequency of the metal
48. The particle nature of light is demonstrated by the
- A. diffraction of light
 - B. photoelectric effect
 - C. speed of light
 - D. colours of light
49. The energy of a photon having a wavelength of 10^{-10} m is
- A. 1.7×10^{-12} J
 - B. 2.0×10^{-15} J
 - C. 1.7×10^{-13} J
 - D. 2.0×10^{-12} J
50. The bond between silicon and germanium is
- A. ionic
 - B. dative
 - C. covalent
 - D. trivalent

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Answers

- 1. Option D.
- 2. Option B.
- 3. Option D.
- 4. Option B.
- 5. Option D.
- 6. Option C.
- 7. Option A.
- 8. Option D.
- 9. Option D.
- 10. Option D.
- 11. Option A.
- 12. Option D.
- 13. Option B.
- 14. Option D.
- 15. Option D.
- 16. Option A.
- 17. Option A.
- 18. Option A.
- 19. Option C.
- 20. Option B.
- 21. Option D.
- 22. Option B.
- 23. Option C.
- 24. Option C.
- 25. Option D.
- 26. Option D.
- 27. Option D.
- 28. Option B.
- 29. Option B.
- 30. Option B.
- 31. Option A.
- 32. Option C.
- 33. Option C.
- 34. Option A.

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35. Option B.
 36. Option A.
 37. Option D.
 38. Option B.
 39. Option C.
 40. Option D.
 41. Option C.
 42. Option D.
 43. Option B.
 44. Option C.
 45. Option D.
 46. Option D.
 47. Option A.
 48. Option B.
 49. Option B.
 50. Option C.

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