NAM DINH DEPARTMENT OF EDUCATION AND TRAINING

OFFICIAL

CONTEST OF MATH AND SCIENCE IN ENGLISH

School year: 2020 - 2021

Subject: physics – Grade 11

Time allowed: 90 minutes

CODE: 317

PART 1. (7.0 marks): single-answer multiple-choice

This is a multiple-choice examination with four options A, B, C or D for each question. There is only one correct or best answer to each question. Write your answer (A, B, C or D) in the correspondingly numbered space on the provided answer sheet.

Question 1: A particle with charge 3.2×10^{-6} C is placed at the origin. An identical particle, with the same charge, is placed 2 m from the origin on the x axis, and a third identical particle, with the same charge, is placed 2 m from the origin on the y axis. The magnitude of the force on the particle at the origin is

A. 2.3×10^{-2} N. **B.** 3.3×10^{-2} N. **C.** 4.6×10^{-2} N. **D.** 6.6×10^{-2} N.

Question 2: A car battery is rated at 80 A.h. An ampere-hour is a unit of

A. power. **B.** energy. **C**. current. **D.** charge.

Question 3: Resistances of 2 Ω, 4 Ω, and 6 Ω and a 24V emf device are all in series. The potential difference across the 2 Ω resistor is

A. 4 V. **B**. 8 V. **C.** 12 V. **D.** 24 V.

Question 4: A 2 kg object is moving at 3 m/s. A 4 N force is applied in the direction of motion and then removed after the object has traveled an additional 5 m. The work done by this force is

A. 12 J. **B.** 15 J. **C.** 20 J. **D.** 40 J.

Question 5: A battery is connected across a series combination of two identical resistors. If the potential difference across the terminals is V and the current in the battery is i, then

A. the potential difference across each resistor is V and the current in each resistor is i.

B. the potential difference across each resistor is V /2 and the current in each resistor is i/2.

C. the potential difference across each resistor is V and the current in each resistor is i/2.

D. the potential difference across each resistor is V /2 and the current in each resistor is i.

Question 6: Resistor 1 has twice the resistance of resistor 2. The two are connected in series and a potential difference is maintained across the combination. The rate of thermal energy generation in resistor 2 is

A. the same as that in1. **B.** twice that in 1. **C.** half that in 1. **D.** four times that in 1.

Question 7: Two bulbs of 500 W and 200 W are manufactured to operate on 220 V line. The ratio of heat produced in 500 W and 200 W, in two cases, when firstly they are connected in series and secondly in parallel will be

A. 2.5 : 2.5. **B.** 2.5 : 0.4. **C.** 0.4 : 2.5. **D.** 0.4 : 0.4.

Question 8: A currents source drives a current in a coil of resistance R_1 for a time t. The same source drives current in another coil of resistance R_2 for same time t. If heat generated is same, internal resistance of source is

A. $\frac{R_1.R_2}{R_1+R_2}$ **B.** R_1+R_2 **C.** $\sqrt{R_1.R_2}$ **D.** $\frac{R_1+R_2}{R_1.R_2}$

Question 9: Which of the following four quantities is not an expression for energy? Here m is a mass, g is the acceleration due to gravity, h and d are distances, F is a force, v is a speed, a is an acceleration.

A. ma. **B.** mgh. **C.** $mv^2/2$. **D.** Fd.

Question 10: Choose the correct statement concerning electric field lines

A. field lines may cross.

B. field lines are close together where the field is large.

C. field lines point away from a negatively charged particle.

D. a charged point particle released from rest moves along a field line.

Question 11: A nichrome wire is 1 m long and 1×10^{-6} m^2 in cross-sectional area. When connected to a potential difference of 2 V, a current of 4 A exists in the wire. The resistivity of this nichrome is:

A. 10^{-7} Ω.m. **B.** 2×10^{-7} Ω.m. **C.** 4×10^{-7} Ω.m. **D.** 5×10^{-7} Ω.m.

Question 12: An electron traveling north enters a region where the electric field is uniform and points south. The electron

A. speeds up. **B.** slows down.

C. veers east. **D.** continues with the same speed in the same direction.

Question 13: Particle 1 with a charge of 1.6×10^{-6} C and a mass of 20 g moves uniformly with a speed of 3 m/s in a circular orbit around a stationary particle 2 with a charge of -1.6×10^{-6} C. Which of the following statement is **incorrect**?

A. The radius of the orbit is 0.128 m. **B.** Frequency of the particle 1 is 3.73 Hz.

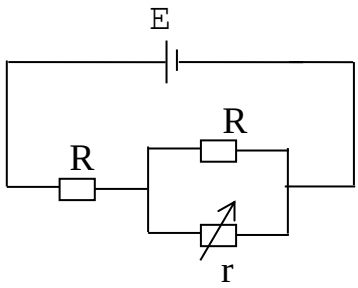
C. Period of the particle 1 is 0.27 s. **D.** The magnitude of the force on particle 1is 0,47 N.

Question 14: An certain resistor dissipates 0.5 W when connected to a 3 V potential difference. When connected to a 1 V potential difference, this resistor will dissipate:

A. 0.5W. **B.** 0.167W. **C.** 0.056W. **D.** 1.5W.

Question 15: In the circuit shown, internal resistance of source is zero. The resistance r is a variable resistance. If for r = kR. The heat generation in r is maximum, then the value of k is

A. 1. **B.** 1/2. **C.** 2. **D.** 1/4.



Question 16: The electric field at a distance of 10 cm from an isolated point particle with a charge of 1.6×10^{-9} C is

A. 144 V/m. **B.** 1440 V/m. **C.** 2304 V/m. **D.** 14400 V/m.

Question 17: What is the equation of Coulomb's law?

A. $F = k\frac{q_1.q_2}{r^2}$. **B.** $F = \frac{q_1.q_2}{r^2}$. **C.** $F = k\frac{|q_1.q_2|}{r^2}$. **D.** $F = \frac{|q_1.q_2|}{k.r^2}$.

Question 18: What is the unit of electric current?

A. Volts **B.** Ohms **C.** Amperes **D.** Joules

Question 19: A object dropped from top of a tower falls through 40 m during the last two seconds of its fall. The height of the tower (in m) is (Take g = 10 m/s^2)

A. 45 m. **B.** 50 m. **C.** 60 m. **D.** 80 m.

Question 20: The current in the metal is the directional displacement of

A. free electrons. **B.** atoms. **C.** positive ions. **D.** negative ions.

Question 21: Which of following quantities is not a vector?

A. Displacement. **B.** Weight. **C.** Acceleration. **D.** Mass.

Question 22: 273 cm^3 of an ideal gas is at 0^0 C. It is heated at constant pressure to 10^0 C. It will now occupy

A. 263 cm^3. **B.** 278 cm^3. **C.** 283 cm^3. **D.** 293 cm^3.

Question 23: Two small charged objects attract each other with a force F when separated by a distance d. If the charge on each object is reduced to one-fourth of its original value and the distance between them is reduced to d/2 the force becomes

A. F/2. **B.** F/4. **C.** F/8. **D.** F/16.

Question 24: Two particles, X and Y, are 4 m apart. X has a charge of 2Q and Y has a charge of Q. The force of X on Y has

A. twice the magnitude of the force of Y on X. **B.** half the magnitude of the force of Y on X.

C. four times the magnitude of the force of Y on X. **D.** the same magnitude as the force of Y on X.

Question 25: A current of 0,5 A exists in a 60 ohm lamp. The applied potential difference is

A. 15 V. **B.** 30 V. **C.** 60 V. **D.** 120 V.

Question 26: Starting from rest, a body slides down a 45^0 inclined plane in twice the time it takes to slide down the same distance in the absence of friction. The coefficient of friction between the body and the inclined plane is

A. 0.33. **B.** 0.75. **C.** 0.8. **D.** 0.25.

Question 27: To make an uncharged object have a negative charge we must

A. add some atoms. **B.** remove some atoms.

C. add some electrons. **D.** remove some electrons.

Question 28: A small object has charge Q. Charge q is removed from it and placed on a second small object. The two objects are placed 1 m apart. For the force that each object exerts on the other to be a maximum, q should be

A. Q/2. **B.** 2Q. **C.** Q. **D.** Q/4.

Question 29: Three unlike resistors are connected in series, each carries currents labeled I_1, I_2 and I_3. Which of the following formula expresses the value of the total current I_T in the combined system?

A. $\frac{1}{I_T}=\frac{1}{I_1}+\frac{1}{I_2}+\frac{1}{I_3}$ **B.** $I_T=I_1+I_2+I_3$

C. $I_T=3I_1=3I_2=3I_3$ **D.** $I_T=I_1=I_2=I_3$

Question 30: Four 20 Ω resistors are connected in series and the combination is connected to a 20 V emf device. The current in any one of the resistors is

A. 0.25 A. **B.** 1.0 A. **C.** 4.0 A. **D.** 5.0 A.

Question 31: If the potential difference across a resistor is doubled,

A. only the current is doubled. **B.** only the current is halved.

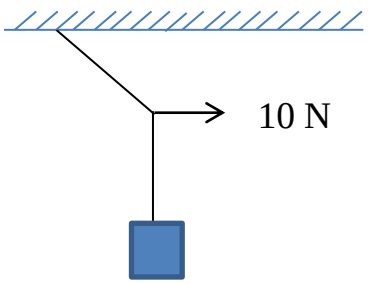
C. only the resistance is doubled. **D.** both the current and resistance are doubled.

Question 32: During an electrolysis of molten sodium chloride (Nacl), a 8A current is passed through electrodes for 2 hours. The atomic weight of sodium is 23. Calculate the mass of sodium that is produced during this time

A. 13.72 mg. **B.** 13.72 g. **C.** 8.31 mg. **D.** 23 g.

Question 33: A block of mass $\sqrt{3}$ kg is suspended by a massless rope of length 2 m from the ceiling. A force of 10 N is applied in the horizontal direction at the midpoint P of the rope, as shown in the figure. The angle made by the rope with the vertical in equilibrium is

A. 40^0. **B.** 30^0. **C.** 45^0. **D.** 60^0.



Question 34: Two forces are applied to a 2kg crate; one is 6 N to the north and the other is 8 N to the west. The magnitude of the acceleration of crate is

A. 3 m/s^2. **B.** 4 m/s^2. **C.** 5 m/s^2. **D.** 7 m/s^2.

Question 35: Two particles have charges Q and −Q (equal magnitude and opposite sign). For a net force of zero to be exerted on a third charge it must be placed

A. midway between Q and –Q.
B. on the perpendicular bisector of the line joining Q and −Q, but not on that line itself .
C. on the line joining Q and −Q, to the side of Q opposite –Q.
D. at none of these places (there is no place).

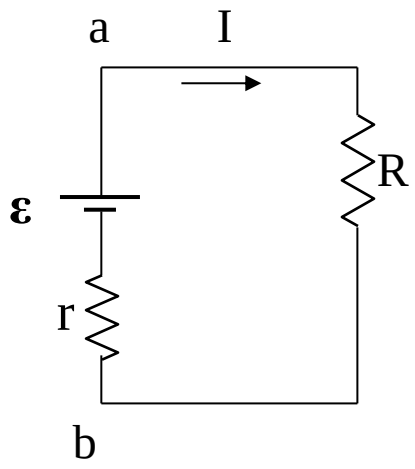
PART 2 (3,0 marks) Problem-solving

Problem 1. A +40 μC charge and a +160 μC charge are set 9.0 m apart. An unknown positive charge is placed on a line joining the first two charges and it is allowed to move until it comes to rest between the two charges. At what distance measured from the 160 μC charge will the unknown charge come to rest?

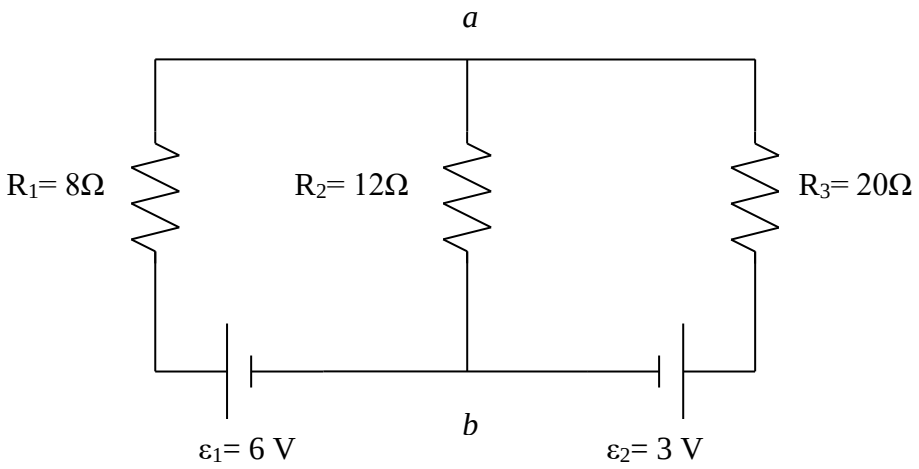
Problem 2.

Calculate the terminal voltage for a battery with an internal resistance of r = 0.9 Ω and an emf of ε =8.5 V when the battery is connected in series with:

(a) R= 81.0-Ω resistor,
(b) R=810-Ω resistor.



Problem 3.
Find the current through each resistor in the multiloop circuit above.



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Student's full name..... Student's ID.....

First observer's name and signature……

Second observer's name and signature……