Candidate's Name: ....

Signature: ....

	Random No.				Personal No.		

535/1
PHYSICS
Paper 1
Oct./Nov.2020
2 ¼ hours

UGANDA NATIONAL EXAMINATIONS BOARD

Uganda Certificate of Education

PHYSICS

Paper 1

2 hours 15 minutes

INSTRUCTIONS TO CANDIDATES:

Section A contains 40 objective type questions. You are required to write the correct answer A, B, C or D in blue or black ink against each question in the box on the right hand side.

Section B contains 10 structured questions. Answers are to be written in the space provided on the question paper.

Do not use pencil except for drawings. Any work done in pencil will not be marked.

Mathematical tables and silent non-programmable calculators may be used.

Acceleration due to gravity, g = 10 ms^{-2}.

Specific heat capacity of water = 4200 Jkg^{-1} K^{-1}.

For Examiners' Use Only

Q.41	Q.42	Q.43.	Q.44	Q.45	Q.46	Q.47	Q.48	Q.49	Q.50	MCQ	Total

Turn Over

SECTION A: (40 MARKS)

Answer all the questions in this section.

1. The point below which a substance exists as a solid is called

    A. freezing point.
    B. boiling point.
    C. evaporation point.
    D. condensation point.

2. The electrical quantity that is measured in volts is

    A. charge.
    B. current.
    C. resistance.
    D. electromotive force.

3. Which one of the following fundamental quantities needs to be measured in order to determine density of a material in shape of a cube?

    A. Length and temperature.
    B. Mass and temperature.
    C. Length and time.
    D. Mass and length.

4. Which one of the following metal layers should be used on jackets worn by workers in an X-ray room?

    A. Iron layers.
    B. Lead layers.
    C. Copper layers.
    D. Aluminium layers.

5. Which one of the following characteristics is associated with images formed by the pin-hole camera?

    A. Magnified.
    B. Upright.
    C. Virtual.
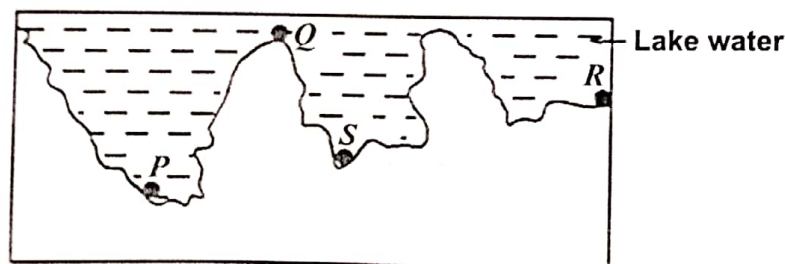   D. Real.

6. Figure 1 shows a cross section of a lake.

Fig. 1

Which one of the points P, Q, R and S has the greatest pressure?

A. P.
B. Q.
C. R.
D. S.

7. A bullet which moves with very high speed penetrates deeply into solid matter because

A. it has large amount of momentum.
B. of sudden change in potential energy.
C. it makes solid matter soft.
D. it is hard.

8. Hot water at a temperature of 70 °C is poured in a beaker containing water of the same mass at 10 °C. Assuming no heat losses, find the temperature of the mixture.

A. 80 °C.
B. 60 °C.
C. 40 °C.
D. 30 °C.

9. Which of the following is/are the reason(s) why diffusion takes place faster in gases than in liquids?

(i) The force of attraction between molecules of a gas is almost negligible.
(ii) The molecules of a gas are denser than those of liquids.
(iii) Gaseous molecules move randomly in different directions.

A. (ii) only.
B. (iii) only.
C. (i) and (ii) only.
D. (i) and (iii) only.

Turn Over

10. Figure 2 shows a body of mass. M. of 1kg acted upon by two forces of 16 N and 12 N.

16N ↑

M ●———→ 12N

Fig. 2
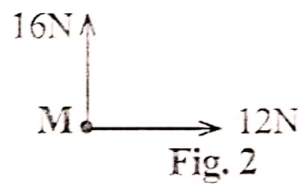
Find the acceleration of the body.

A.   4.0 ms^{-2}.
B.   8.0 ms^{-2}.
C.   12.0 ms^{-2}.
D.   20.0 ms^{-2}.

11. The output voltage of a given transformer is higher than the input voltage. Which one of the following statements explains this?

A.   It has a bare wire in the secondary coil.
B.   It has a direct current in the primary coil.
C.   Its secondary coil has more turns than the primary coil.
D.   Its primary coil has more turns than the secondary coil.

12. Figure 3 shows a crowbar used to lift a load which is 0.3 m from the pivot.

0.9 m

0.3 m

↓ Effort

Load—
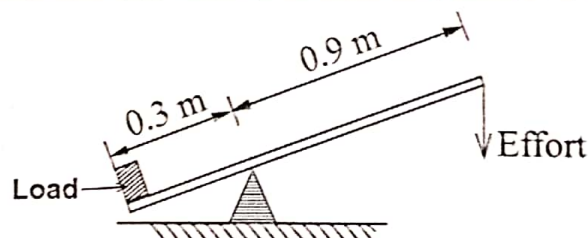
Fig. 3

Find the velocity ratio of the crowbar.

A.   3.00.
B.   1.20.
C.   0.60.
D.   0.27.

13. An insect can walk on the surface of water without sinking because

A.   of capillary attraction on the water surface.
B.   it is less dense than water.
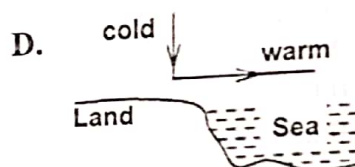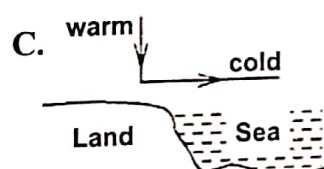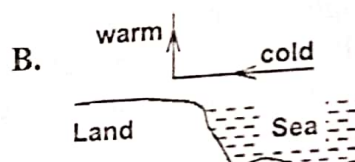C.   of surface tension.
D.   of adhesion force.

14. A pin exerts a pressure of 50 Nm^{-2} on a surface. If the force on the pin is 5 N, find the area of contact between the pin and the surface.

    A. 1.0×10^{-2} m^2.
    B. 1.0×10^{-1} m^2.
    C. 1.0×10^{1} m^2.
    D. 2.5×10^{2} m^2.

15. Which of the following is a set of electromagnetic waves only?

    A.   X - rays, ultraviolet, microwaves, sound waves.
    B.   Light, X-rays, radio waves, ultraviolet.
    C.   Microwaves, green light, Gamma rays, sound waves.
    D.   X-rays, Gamma-rays, water ripples, string waves.

16. A mass stretches a spring from a length of 2.0 cm to 5.0 cm. If the spring constant is 1000 Nm^{-1}, find the mass.

    A.   25.0 kg.
    B.   5.0 kg.
    C.   3.0 kg.
    D.   2.0 kg.

17. Which of the following statements is correct about the resultant acceleration of a body when acted upon by a force?

    (i)   It is independent of the mass of the body.
    (ii)   The greater the force the greater the acceleration.
    (iii)   The acceleration takes place in the direction of the resultant force.

    A.   (i) only.
    B.   (ii) only.
    C.   (i) and (ii) only.
    D.   (ii) and (iii) only.

18. The successive crests as seen in a ripple tank with a vibrator of frequency 10 Hz are 0.05 m apart. Find the speed of the water.

    A. 5.0×10^{-3} ms^{-1}.
    B. 5.0×10^{-1} ms^{-1}.
    C. 2.0×10^{0} ms^{-1}.
    D. 2.0×10^{2} ms^{-1}.

19. Which one of the following statements is true about an accumulator?

    A.   When fully charged, its e.m.f is 1.25 V.
    B.   When fully charged, its relative density is 2.2 kgm^{-3}.
    C.   Should be charged regularly using a specified current.
    D.   Its positive terminal is lead and the negative terminal is lead(IV) oxide.

Turn Over

20. Find the volume of water displaced when a solid of mass 1.75 kg and density 8750 kgm⁻³ is immersed in it.

   A. 2.00×10^{-4} m³.
   B. 5.00×10^{3} m³.
   C. 1.53×10^{3} m³.
   D. 1.53×10^{4} m³.

21. Which one of the following diagrams completes the convection of air during the day?

   A. cold ↑ warm ← | Land / Sea
   B. warm ↑ cold ← | Land / Sea
   C. warm ↓ cold → | Land / Sea
   D. cold ↓ warm → | Land / Sea
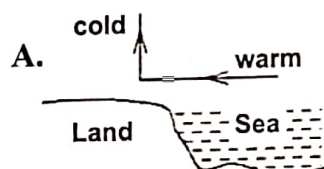
22. A flute produces musical notes of better quality than a whistle. This is because a flute produces

   A. fundamental note only.
   B. notes of bigger amplitude.
   C. notes of higher frequencies.
   D. more notes of different frequencies simultaneously.

23. Figure 4 shows a steel bar wound with copper wires.

Steel bar →
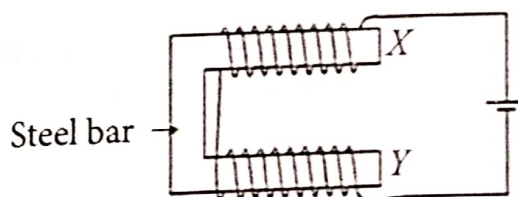
Fig. 4

The poles at X and Y are

	X	Y
A.	North	North.
B.	North	South.
C.	South	North.
D.	South	South.

6

24. Which one of the following nuclides is an isotope of the nuclide $^{36}_{19} X$?

A. $^{35}_{18} W$.

B. $^{35}_{19} Z$.

C. $^{36}_{17} R$.

D. $^{36}_{18} Y$.

25. A material is said to be ductile because it
   (i) undergoes only elastic deformation.
   (ii) undergoes both elastic and plastic deformation.
   (ii) easily breaks down when a force is applied.

A. (ii) only.

B. (i) and (ii) only.

C. (i) and (iii) only.

D. (ii) and (iii) only.

26. An object of height 2 cm placed 10 cm in front of a convex lens forms an image 30 cm from the lens. Find the height of the image.

A. 1.5 cm.

B. 3.0 cm.

C. 5.0 cm.

D. 6.0 cm.

27. Three objects X, Y and Z are metal spheres. If X experiences a force of attraction from both Y and Z, which one of the following set of charges is correct?

	X	Y	Z
A.	Positive	Positive	Negative.
B.	Negative	Negative	Positive.
C.	Positive	Negative	Positive.
D.	Negative	Positive	Positive.

28. Figure 5 shows a velocity-time graph.
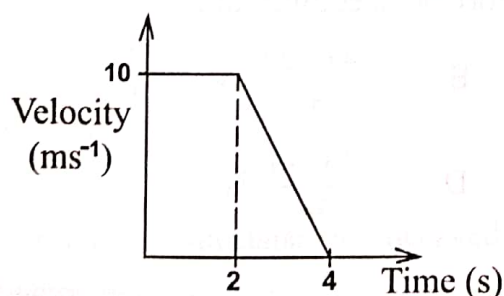
Fig. 5

Find the distance covered.

A. 10 m.

B. 20 m.

C. 30 m.

D. 40 m.

Turn Over

29. Which one of the following is changed in order to change the number of electrons hitting the screen of a cathode ray oscilloscope?

A. Anode potential. B. Grid potential.

C. p.d between X-plates. D. p.d between Y-plates.

30. Figure 6 shows two identical cells of total internal resistance of 2.0 Ω, connected to the ends of 2.5 Ω resistor.

$$r = 2.0 \, \Omega$$

0.65A

2.5 Ω
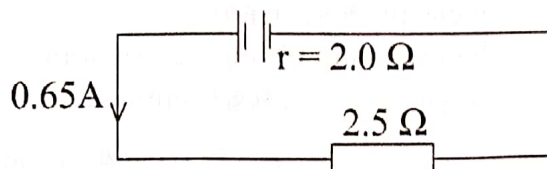
Fig. 6

If the current in the circuit is 0.65 A, find the e.m.f of each cell.

A. $\left[\dfrac{0.65(2+2.5)}{2}\right]$ V. B. $\left[\dfrac{2(2+2.5)}{0.65}\right]$ V.

C. $\left[\dfrac{0.65\times2}{(2+2.5)}\right]$ V. D. $\left[\dfrac{2+2.5}{0.65\times2}\right]$ V.

31. Figure 7 shows a beam of length 50 cm and negligible weight pivoted at the zero - mark.

0 cm mark   30 cm mark   U

50 cm mark

4.0 N
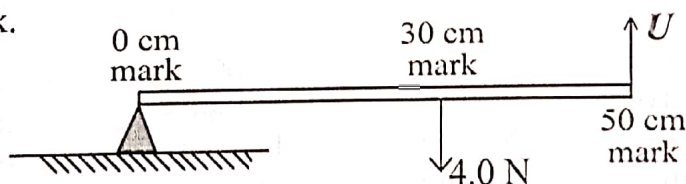
Fig. 7

If a force of 4.0 N is applied at the 30 cm mark, determine the upward force, U, required to keep the beam in horizontal equilibrium.

A. $\left(\dfrac{4.0\times30}{50}\right)$ N. B. $\left(\dfrac{4.0\times20}{50}\right)$ N.

C. $\left(\dfrac{4.0\times50}{30}\right)$ N. D. $\left(\dfrac{30\times50}{4.0}\right)$ N.

32. Which of the following statement(s) is/are true about an electromagnet?

(i) It acts as a magnet only when current is in the coil.

(ii) It acquires both the magnetic field of the iron and solenoid when current is on.

(iii) It becomes a stronger magnet when current is increased.

A. (i) only. B. (i) and (ii) only.

C. (ii) and (iii) only. D. (i), (ii) and (iii).

8

33. An engine gives a driving force of 500 N to a car. If the car accelerates uniformly at a rate of 5 ms⁻². Find the mass of the car.

A. $\left(\dfrac{5}{500}\right)$ kg.

B. $\left(\dfrac{500}{5\times10}\right)$ kg.

C. $\left(\dfrac{500}{5}\right)$ kg.

D. (500×5) kg.

34. Which of the following statements explain(s) what happens when the frequency of a wave is halved at constant speed?
   (i) The amplitude of the wave is halved.
   (ii) The period of the wave is doubled.
   (iii) The wave length remains constant.

A. (ii) only.
B. (i) and (ii) only.
C. (i) and (iii) only.
D. (ii) and (iii) only.

35. A car engine uses a force of 5,000 N to move the car with a steady speed of 10.0 ms⁻¹. Find the power developed in the engine.

A. 50,000 kW.
B. 500 kW.
C. 50 kW.
D. 5 kW.

36. A ray of light is incident on a glass block at an angle of 55° to the normal. If the refractive index of the glass is 1.49, find the angle of refraction.

A. 22.6°.
B. 33.4°.
C. 35.0°.
D. 58.7°.

37. A radioactive substance has decayed to $\dfrac{1}{32}$ of its original mass after 50 days. Find its half-life.

A. 16.7 days.
B. 12.5 days.
C. 10.0 days.
D. 3.1 days.

9

Turn Over

38. Figure 8 shows a bar magnet rotated near a coil.
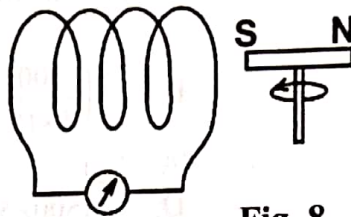
Fig. 8

Which of the following changes will increase the size of the induced e.m.f?

(i) Moving the magnet away from the coil.
(ii) Using a coil with more turns.
(iii) Rotating the magnet in same direction with greater speed.

A. (i), (ii) and (iii).
B. (ii) and (iii) only.
C. (i) and (iii) only.
D. (i) and (ii) only.
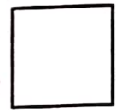
39. Which of the following is true about the appearance of objects in white light?

(i) Surfaces which reflect all colours of light appear white.
(ii) Surfaces which absorb all colours and reflect red, will appear red.
(iii) Black surfaces appear black because they reflect all colours.

A. (i) only.
B. (i) and (iii) only.
C. (i) and (ii) only.
D. (ii) and (iii) only.
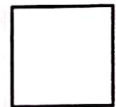
40. The cost of electrical energy is UGX 600 per unit. Find the cost of using an electrical heater rating 1.5 kW for a whole day.

A. UGX 1.5 ×24 × 600.

B. UGX 1.5 ×12 × 600.

C. UGX $\dfrac{600}{1.5 \times 24}$.

D. UGX $\dfrac{600}{1.5 \times 12}$.

SECTION B

*Answer **all** questions in this section.*
All working must be shown clearly in the spaces provided.

41. (a) The density of a given oil is 900 kgm^{-3}. What does this statement mean? *(01 mark)*

....

....

(b) An ordinary cup has a volume of 500 cm^3. It weighs 80 g when empty and 480 g when filled with kerosene.

Find the;

(i) mass of kerosene in the cup. *(01 mark)*

....

....

(ii) density of kerosene in kgm^{-3}. *(02 marks)*

....

....

42. (a) What is meant by **heat conduction**? *(01 mark)*

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....

....

(b)
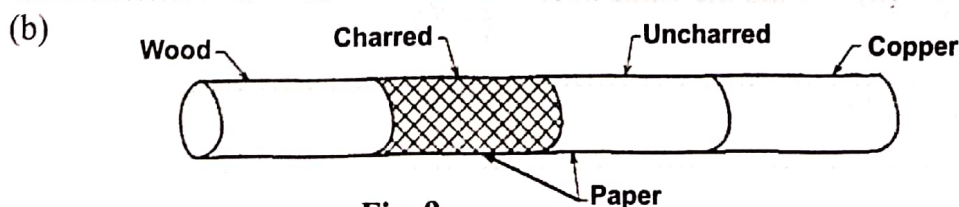
Fig. 9

A composite rod is made by joining a wooden rod with a copper rod. A piece of paper is wrapped round the composite rod as shown in figure **9** and passed through a flame several times. Explain why the paper over wood charred before that over copper. *(03 marks)*

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43. **(a)** What is meant by the terms **atomic number** and **mass number** of an atom? *(02 marks)*

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(b) An element $^{6}_{R}X$ is bombarded with a neutron to produce a nuclide $^{3}_{1}Y$ and an alpha particle.

(i) Write an equation for the reaction. *(01 mark)*

....

....

(ii) Find the value of R. *(01 mark)*

....

....

44. (a) (i) What is meant by **rectilinear propagation of light?** (*01 mark*)

....

....

(ii) State **one** effect of rectilinear propagation of light. (*01 mark*)

....

(b) An object 15 mm high is placed at a distance of 60 mm from a pin hole. Calculate the distance of the image from the pin hole if the height of the image is 5 mm. (*02 marks*)

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45. (a) What is a **brittle material?** (*01 mark*)

....

....

(b) State **two** examples of brittle materials. (*01 mark*)

....

(c) The force constant of a wire is 50 Nm^{-1}. Find the force that causes an extension of 5 cm in the wire. (*02 marks*)

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Turn Over

46. (a) State **one** factor that affects electrical resistance of a wire. *(01 mark)*

....

(b) Figure **10** shows a complete circuit consisting of a cell of e.m.f 2 V, internal resistance 0.2 Ω, meters P and O.

2V, 0.2 Ω
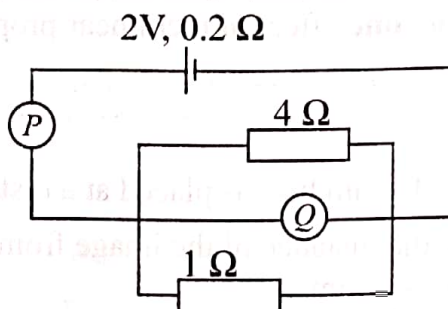
Fig. 10

(i) Name meter Q. *(01 mark)*

....

(ii) Find the reading of metre P. *(02 marks)*

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47. (a) (i) Define **force** as applied to physics. *(01 mark)*

....

(ii) State **two** effects of a force on a body. *(01 mark)*

....

....

(b) A box of mass 20 kg rests on a flat horizontal floor. If the density of air is negligible,

(i) draw a diagram showing the forces acting on the box. *(01 mark)*

(ii)   find the reaction of the floor on the box.   *(01 mark)*

....

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48. (a) (i)   Define **reverberation** as applied to sound waves.   *(01 mark)*

....

....

(ii)   State **one** importance of reverberation.   *(01 mark)*

....

....

(b)   Ultra-sonic waves are sent vertically down the bottom of a sea and the echo is received after 8.4 s. Calculate the depth of the sea at the point, given that the velocity of sound in water is 1,500 ms^{-1}.   *(02 marks)*

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49. (a)   Identify from the following, **two** vector quantities: momentum, energy, speed and velocity.   *(01 mark)*

....

(b)   A trolley P of mass 0.5 kg moves with a velocity of 12 ms^{-1} and collides with another stationary trolley Q of mass 1.5 kg. After collision, P comes to rest and Q moves with a constant velocity V.

(i)   What type of collision is this, if the kinetic energy is conserved?
          (01 mark)

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15   **Turn Over**

(ii)   Find the value of V.   (*02 marks*)

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50.   **(a)**   What is a **soft magnetic material**?   (*01 mark*)

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(b)   Figure **11**, shows an arrangement of a lamp, soft iron ball attached to a spring, two cells A and B, and a coil wound round a soft iron bar.
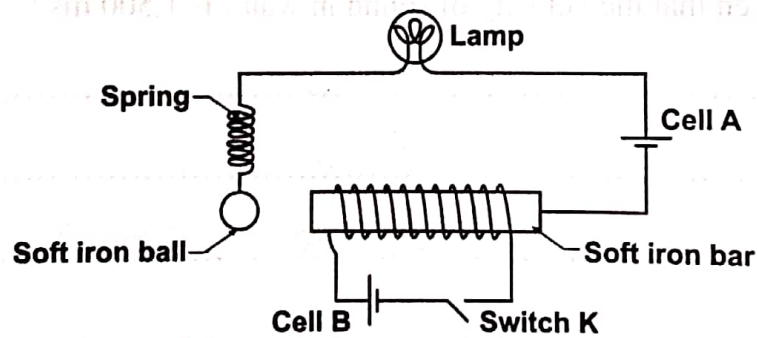

Fig. 11

Explain what would be observed when switch K is closed.   (*02 marks*)

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(c)   State **one** application of electromagnets.   (*01 mark*)

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END