Blakehurst High School

Year 12 Half Yearly Examination 2003

2U Physics

Time allowed: 1½ hours plus 5 minutes reading time.

Instructions:

Attempt **all** questions

This paper has 2 parts:

Part A: 10 multiple choice questions – Answer on the grid provided.

Part B: 40 marks - Answer in the spaces provided.

SHOW ALL WORKING

Part A For each question (1 - 10) choose the best of the four possible answers and indicate your choice by filling in the appropriate space on the Answer Sheet provided. Fill in only ONE choice for each question using a ball point or ink pen. If you change your mind, draw a cross through your first mark completely.

1. A person measures their weight in a stationary lift. The same person measures their weight again when the lift is moving upwards at a constant $5ms^{-1}$. Their weight would now be:

(A) lighter then when the lift was stationary

(B) the same as when the lift was stationary

(C) heavier then when the lift was stationary

(D) incalculable, due to lack of information

2. Which of the following is **not** a contribution Goddard made to the development of space flight?

(A) Added gyroscopes to rockets to help guide their flight paths

(B) Calculated that a rocket must exceed $11.2kms^{-1}$ to escape earth's gravitational influence

(C) Proved that rocket engines could produce thrust in a vacuum

(D) Launched the first liquid-fuelled rocket

3. Communications satellites, responsible for relaying phone and television signals to a particular area, are best suited for which type of orbit.

(A) Low earth orbit

(B) Geostationary Orbit

(C) Polar orbit

(D) Elliptical orbit

4. Which of the following statements is true for an object undergoing uniform circular motion?

(A) It has a constant velocity and a constant acceleration

(B) It has a constant velocity and no acceleration

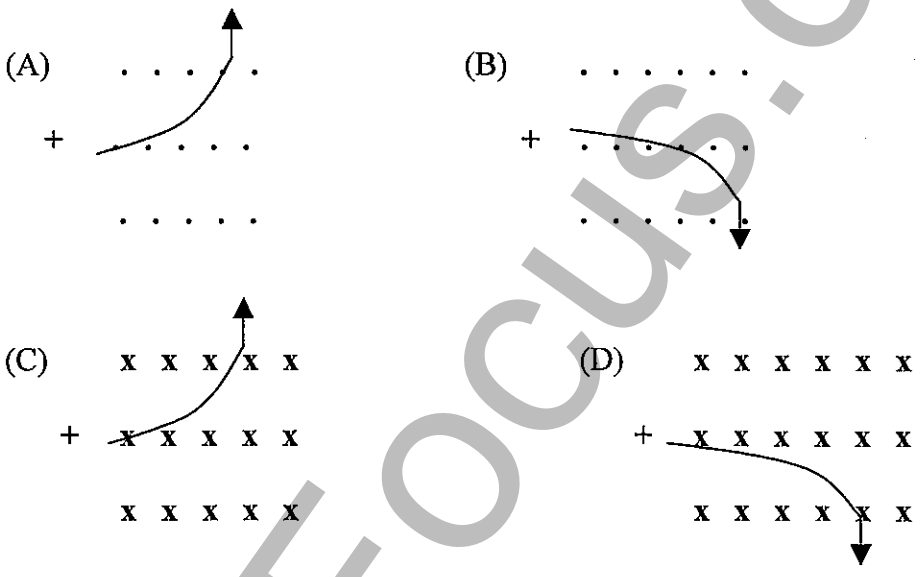
(C) It has a constant speed and a constant acceleration

(D) It has a constant speed and no acceleration

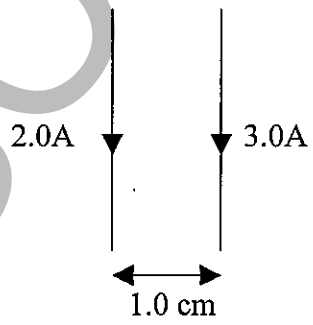
5. A spacecraft travelling at 0.9c had a length of 120m when it left home base. Its length observed from home and by its crew is;

	Home	**Crew**
(A)	120m	52m
(B)	120m	120m
(C)	52m	120m
(D)	52m	52m

6. A positive charge moves into a magnetic held as shown. The correct path followed is:



7. Two wires carry currents as shown below:



The force per metre between the two wires is:

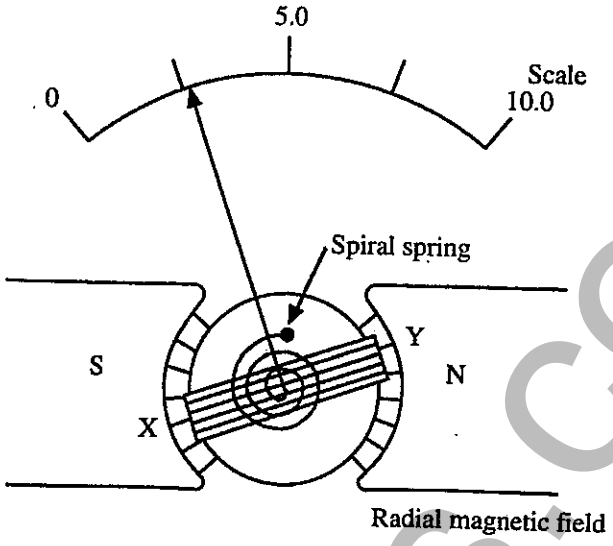
(A) 1.2 X 10^{-4} N attraction.

(B) 1.2 X 10^{-4} N repulsion.

(C) 2.0 X 10^{-4} N attraction.

(D) 1.2 X 10^{-3} N repulsion.

8. An electric meter draws a small current through a coil of wire sitting inside a radial magnetic field. The front of the coil is labeled X - Y and the magnetic poles of the radial magnetic field are as shown in the diagram.



The main reason for using a radial magnetic field in the meter is to

(A) allow the torque to remain constant as the meter needle moves across the scale.

(B) allow the divisions on the scale to be in a uniform linear form.

(C) produce a uniform magnetic field between the opposite poles.

(D) allow the torque on X—Y to act always in the same direction.

9. Which of the following statements is the best to describe Lenz's Law?

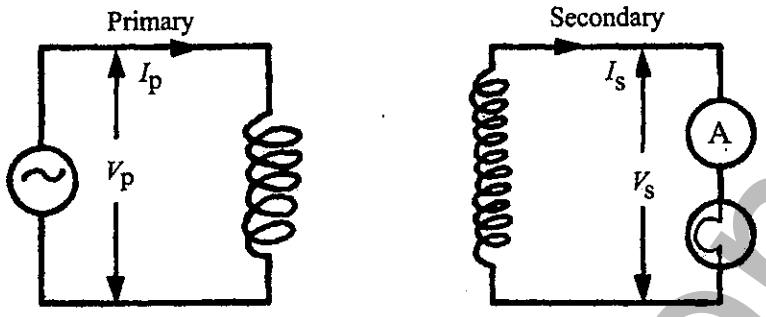
(A) A current-carrying wire produces a magnetic field around it in concentric circular loops.

(B) The induced emf is directly proportional to the rate of change of magnetic flux.

(C) The direction of an induced emf is such as to create a current to oppose the change which created it.

(D) A changing electric field will produce a changing magnetic field.

10. An ideal voltage transformer which has more turns of wire in the secondary coil than the primary coil is shown in the diagram.



The purpose of this transformer is to make the following happen in the secondary:

(A) Increase the voltage and decrease the current in the secondary.

(B) Increase the current while the voltage remains constant in the secondary.

(C) Increase the current while the voltage remains constant in the secondary.

(D) Increase the voltage and current in the secondary.

Part B Write your answers in the spaces provided.

11. A spacecraft on earth weighs 2273000kg. After launch it reaches a velocity of 0.45c. What is its relativistic mass now? **(2)**

12. A projectile is launched horizontally at $28ms^{-1}$ at a height of 36m above the ground.
(A) How long does it take to reach the ground? **(2)**

(B) Where does it hit the ground? **(2)**

(C) What is its velocity just before it hits the ground? **(2)**

13. Describe how the "slingshot effect" helps space probes journey through the solar system. **(4)**

14. Describe what the Michelson-Morley experiment was attempting to prove and its results. **(4)**

16. A body of mass 210kg attracts another body with a force of 45×10^{-4}N. If the two bodies are 15m away from each other, what is the mass of the second body? **(2)**

17. In a nuclear power plant 36g of uranium is converted into energy. How much energy is produced? **(2)**

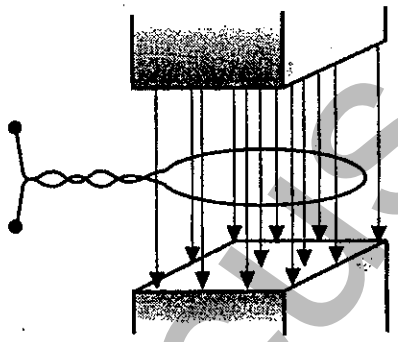
18. Describe the forces experienced by a current-carrying loop in a magnetic field and describe the net result of the forces. **(3)**

19. A d.c. electric motor has a rectangular coil containing 120 loops, 150 mm x 100 mm. The coil sits in a magnetic field of 250 mT. The power supply attached to the motor causes a current of 6.8 A to flow through a split-ring commutator to the loops of the motor coil.

(A) Describe, including a diagram, the function of the split-ring commutator. **(3)**

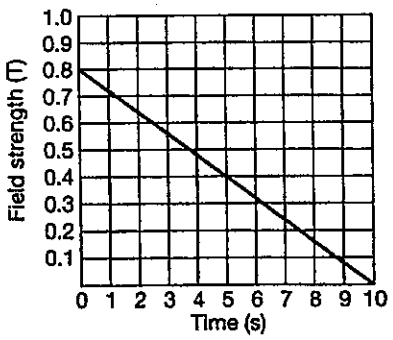
(B) What torque acts on the motor coil? **(1)**

20. A single loop of insulated wire is in a uniform magnetic field of 0.80T. The area of the coil is 7.5×10^{-3} m^2.



(A) What is the magnetic flux through the coil? **(1)**

(B) The field provided by the magnet is reduced at a constant rate over a period of 10 sec, as shown in the graph below.



What average emf would be measured across the ends of the coil during those 10 seconds? **(1)**

21. Originally the electrical energy supplies for domestic, commercial and industrial purposes were d.c. supplies with a.c. motors then non-existent. With the development of a.c. motors and generators by Nikola Tesla, the change to a.c. power supplies slowly emerged, eventually becoming the preferred form for electrical transmission and systems.

(A) Describe one significant advantage a.c. motors and generators have over their d.c. equivalents, and explain why this advantage exists. **(2)**

(B) Explain the advantages of transmitting electrical energy as a.c rather than d.c. **(2)**

22. Assess the effects of the development of AC generators on society and the environment. **(4)**

23. Compare step-up and step-down transformers. **(3)**