Name: _____

BLAKEHURST HIGH SCHOOL

Year 12 Half Yearly Exam

PHYSICS

2005

1½ hours

Name: _____

Year 12 PHYSICS Half Yearly 2004

Question	A	B	C	D
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				

Part A

Total marks 10
Attempt Questions 1 – 10
Allow about 20 minutes for this part

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1. Which of the following graphs best depicts the variation of gravitational force F, with distance d, from the centre of the earth?

2. A satellite is in a stable, circular orbit around the earth at an altitude of 100km. When considering the velocity and acceleration of the satellite as it orbits, which of the following would be true?

   (A) The magnitude of both velocity and acceleration would change continuously.
   (B) Both the acceleration and velocity remain constant throughout the orbit.
   (C) The acceleration remains constant but only the magnitude of the velocity does not change.
   (D) Only the magnitude of the acceleration and velocity remain constant.

3. Two planets, X and Y, travel around a star in the same direction, in circular orbits. Planet X completes one revolution about the star in time T. The radii of the orbits are in the ratio 1:4

   How many revolutions does planet Y make about the star in the same time (T)?

   (A) ½ revolution
   (B) 2 revolutions
   (C) $^1/_8$ revolution
   (D) 8 revolutions

4. Which of the following was essential to allow Einstein to develop his Special theory of relativity?

   (A) Time dilates when objects approach the speed of light.
   (B) The speed of light was a constant.
   (C) Energy and mass were equivalent.
   (D) All of the above.

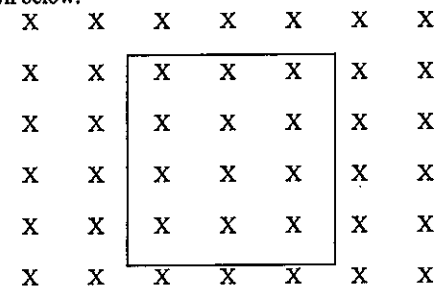
5. Use the data in the table below to answer the following question.

Planet	Acceleration due to Gravity
Earth	$9.8ms^{-2}$
Mars	$3.7ms^{-2}$

A person stood on scales that were designed for earth whilst on Mars. The scale gave a reading of 50kg. What is the actual mass of the person?

(A) 18.9kg
(B) 50N
(C) 132.4kg
(D) 490N

6. The following diagram shows a square loop of wire of sides 5 cm in a magnetic field as shown below:



Which of the following changes would result in the greatest increase in the magnetic flux?

(A) Doubling the magnetic field strength.

(B) Decreasing the area of the loop by half.

(C) Making the loop into a circular shape with radius 5 cm.

(D) Making the loop into a circular shape with radius 2 cm.

7. In a certain electric motor, wires that carry a current of 5 A are perpendicular to a magnetic field of 0.8 T. What is the force on each centimetre of these wires?

(A) 0.004 N

(B) 0.04 N

(C) 0.4 N

(D) 4 N

8. Magnetic flux and magnetic field strength can be described using the concept of "field lines".

What is the best description of magnetic flux and magnetic field strength?

	Magnetic flux	Magnetic field strength
(A)	Number of field lines divided by area	Total number of lines of force
(B)	Number)of field lines multiplied by area	Total number of lines of force
(C)	Total number of lines of force	Number of field lines multiplied by area
(D)	Total number of lines of force	Number of field lines divided by area

9. The current flowing in a DC motor reduces while the motor's speed increases. How can this change in current be accounted for?

(A) The wires increase in resistance as the coil spins, leading to a reduction in current
(B) The back emf reduces the resistance leading to a reduction in the current in the circuit
(C) The increase in kinetic energy of the motor must be matched by a decrease in electrical energy in the circuit
(D) A governor is used to reduce the current in the circuit as the motor spins more rapidly to reduce the chance of the motor burning out

10. Which of the following correctly describes the function of the split-ring commutator in a D.C generator?

(A) To ensure the current to the external circuit always flows in the same direction.

(B) To change the current direction in the generator coils so that it always flows through them in the same direction.

(C) To change the direct current produced by the rotating coil into alternating current for use in the external circuit.

(D) To ensure the torque on the generator coil is always in the same direction so that it continues rotating.

Short Answer

Answer **all** questions in the **spaces** provided.

11. The experiments carried out by Albert Michelson and Edward Morely won Michelson a U.S. national prize in Physics in 1888 for, as it was described;

"Not only for what he has established but also for what he has unsettled".

Discuss the results of the Michelson – Morely experiment with reference to "what he has unsettled". **5**

12. Describe Galileo's analysis of projectile motion. **2**

13. A projectile is fired at 30^0 to the horizontal from a cliff 20m high. If the projectile takes 10s to hit the ground, calculate the initial speed of the projectile. **4**

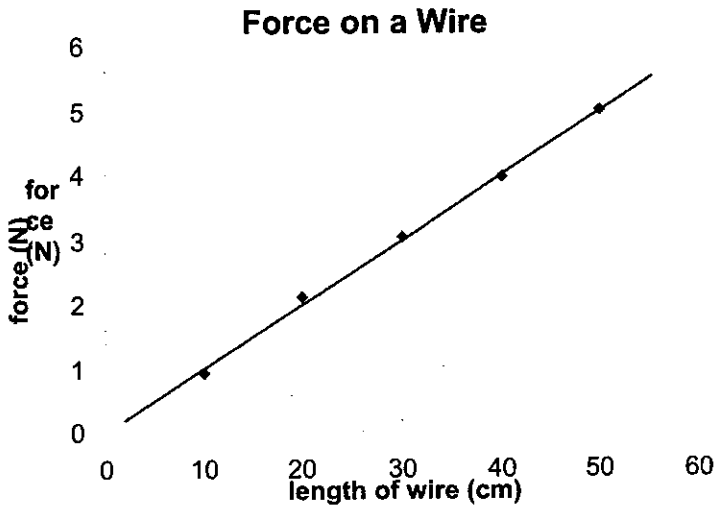
14. During your course you have performed a first hand investigation to determine the value of acceleration due to gravity.
Outline a procedure to determine this value. **2**

15. In physics we always assume the value for acceleration due to gravity on Earth to be $9.8ms^{-2}$. However this is only an average. Identify possible reasons why the acceleration due to gravity varies around the Earth. **2**

16. A muon has a rest lifetime of $1x10^{-6}s$. A muon travelling at high speed in a particle accelerator is found to have a lifetime of $2x10^{-6}s$. What is the speed of the muon? **2**

17. Describe some of the relativistic implications that need to be considered when making calculations about objects travelling at speeds near c (speed of light)? **3**

18. A student performed an experiment to measure the force on a wire caring a current of 9.0 A in magnetic field (**B**). The student varied the length (**l**) of the wire and graphed the results, which are shown below.



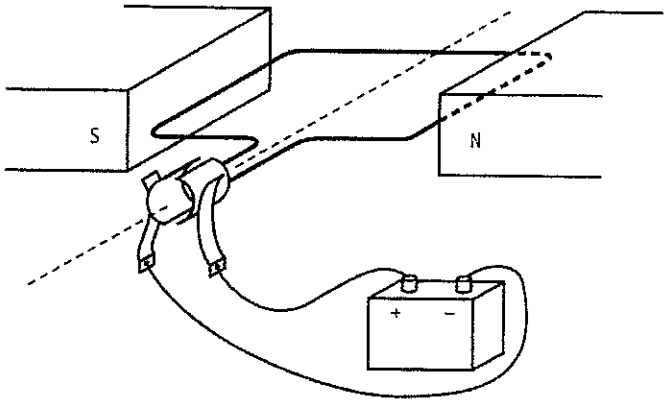
(A) Use the gradient of the line of best fit drawn by the student to calculate the value of **B**, the magnetic field. **3**

(B) Describe the effect of the force on the wire of turning the wire slowly until the wire is parallel to the direction of the magnetic field. **1**

19. Describe a first-hand investigation to demonstrate the effect on a generated electric current when the relative motion between the magnet and the coil is varied. **5**

In your description, include:
a labelled sketch of the experimental set-up
how you varied the relative motion of the magnet and the coil
how other variables were controlled.

20. An outline of the features of a DC motor is shown in the diagram below. The wire loop has 100 turns and a square side of 0.050 m. The magnetic field strength is 0.50 T and a current of 5 A flows through the circuit.



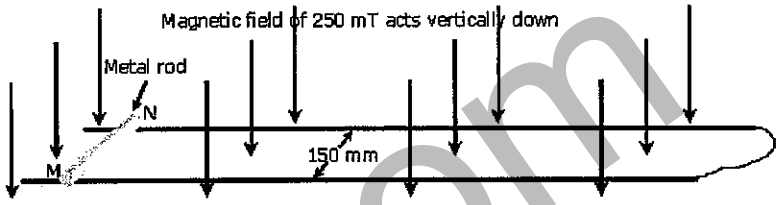
(A) In which direction will the coil rotate? 1

(B) Describe the role of the commutator. 2

(C) (i) Calculate the torque generated when the coil is in the position shown. 2

(ii) Calculate the torque generated when the coil is at right angles to the position shown. 1

21. In a demonstration device a light metal rod, **M-N**, sits on two parallel metal rails of negligible friction and electrical resistance, a distance 150 mm apart. A uniform magnetic field of 250 mT acts vertically down as shown.
A force is applied to the metal rod so that it moves at 10 ms^{-1} to the right, sliding easily along the horizontal rails.



(A) On the diagram show the direction of the current in the completed circuit. 1

(B) With reference to the physical principles involved, explain how the motion of the rod will change with time. 4